PROCEEDINGS

OF THE

Academy of Natural Sciences

OF

PHILADELPHIA.

PART II.—April, May, June, July, August, and September, 1874.

PUBLICATION COMMITTEE.

Joseph Leidy, M.D.,
Geo. W. Tryon, Jr.,
Wm. S. Vaux,
Edw. J. Nolan, M.D.,
W. S. W. Ruschenberger, M.D.

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Corner of Broad and Sansom Streets.
1874.

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January, 1873.

APRIL 7.

Dr. JOS. LEIDY in the chair.

Sixteen members present.

The Blue Gravel of California. By E. GOLDSMITH.—Under the name of "Blue Gravel" the California gold miners, and especially the placer miners, understand a rock which underlies the goldbearing alluvium of that State and part of Nevada. Specimens of this rock were shown to me by John C. Trautwine, C.E. It is stated that, whenever the goldbearing sand in many localities in the two above-named States has been removed by the well-known washing process, the "blue gravel" appears. It also contains gold, which cannot, however, be extracted by washing, the stream of water being unable to disintegrate the rock, which is a compact composite one, and not, as the name "gravel" would imply, a loose material.

This so-called "blue gravel" is composed of two ingredients widely differing in age, namely, of pebbles cemented together by a lava. The pebbles are of all sizes. In the specimens alluded to, they are very smooth and rounded, and present no sharp edges or grooves. Their color is externally brownish, with a slight yellow or olive green, but without the least trace of blue. When a pebble is scraped or cut with a knife, the fresh exposed surface is bluish-gray. The hardness is 4. From the general appearance I infer that some of these pebbles were derived from the sedimentary rock, slate, and others from Hornblende rock.

Entirely different in general aspect from the rounded pebbles is the other part of the rock, which I have already stated to be a lava. This appears to envelop the pebbles completely. When we detach a pebble from the enveloping mass, a perfect impression of the same is observed, having a beautiful lustre as if it had been freshly oiled. This oily lustre, indeed, characterizes the entire enveloping mass. Some of the dull pebbles are as it were externally polished by a coating of the volcanic glass which has run over them. The lustre of the freshly exposed surfaces is brilliant, but it sometimes loses its brilliancy and becomes dull with handling. The color is dirty olive-green. This lava is very brittle, so much so that the preparation of a thin plate for microscopical observation is impossible. The hardness is equal to apatite.

The most distinguishing crystallization within the lava mass is a black mica, which is probably biotite. I noticed also a few grains of quartz, as well as flattened grains of bright yellow gold. These are all observable by the naked eye, and, with the pocket

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lens, I could detect nothing more. When small fragments of irregular form were placed under a more powerful magnifier, the black mica appeared smoky by a transmitted light, or green when in very thin plates, and most of the material seemed to be a green amorphous glass, having no effect on polarized light. The specific gravity I found to be 2.48. The silica I determined by an analysis to be 65.48 per cent. We might presume that the amount of silica should be greater than that obtained, but we must keep in mind that the biotite present contains only about 40 per cent. of it, and thus reduces the proportion; however, the quantity indicates that we must class this lava among the acidic ones. The conclusion at which I arrive is that the so-called "blue gravel" of California is a conglomerate of pebbles of various kinds cemented together by an acidic lava in which crystals of mica (biotite) and grains of gold are imbedded.

How the gold came into the lava is a question of some difficulty. Whether it was mingled with the pebbles before the lava ran over the bed, or whether the gold was ejected from the volcano, I am not able to decide. It would require observations on a variety of specimens to arrive at some plausible theory. The specimens I have seen had the gold suspended in the lava. The metal did not touch the pebbles; therefore, if the gold was present in the pebble bed prior to the ejection of the lava, this latter must have raised the metal from its bed, that is to say, a metal of s. g. 19.3 must have been raised by a semifluid mass having s. g. = 2.48!

Of course my observations are limited on these questions, but since copper was ejected by the ancient volcano on Lake Superior, may not gold have been similarly ejected in the case before us?

April 14.

The President, Dr. Ruschenberger, in the chair.

Twenty-two members present.

Prof. Leidy called attention to the "Bulletin of the United States Geological and Geographical Survey of the Territories, No. 2," presented this evening. It contains a "Review of the Vertebrata of the Cretaceous Period found west of the Mississippi River," by Prof. Cope. In this article he was quoted in such a way as not fairly to express his original meaning. Thus, on page 7 of the Bulletin, reference is made to the Proceedings of this Academy, 1856, p. 312, in which it is intimated that Thespesius occidentalis was referred to the Mammalia, and regarded, perhaps, as a Dinosaurian. In the Proceedings I have rather expressed the reverse, as I state of T. occidentalis, "among the collection of vertebrate remains, are two apparent caudal vertebræ and a first phalanx of some huge animal, which I suspect to be a

Dinosaurian, though they may have belonged to a mammalian." I may add that, on p. 8, Prof. Cope, quoting from the same Proceedings, p. 89, indicated that I had referred Ischyrotherium to a Sirenian. This is so, but Prof. Cope appears to have overlooked the more full account of the animal in the Trans. of the Am. Phil. Soc., 1859, p. 151, in which, though I still refer it with doubt to the mammalia sirenia, I state that the remains may have belonged to an aquatic reptile.

In view of the reptilian character of Ischyrotherium, Prof. C. has changed the name to Ischyrosaurus, but his reason for doing so appears to me not to be valid, as classical authorities at times have included reptiles in the word *therion*, and it has been considered admissible as applied to the extinct Cheirotherium.

April 21.

The President, Dr. Ruschenberger, in the chair.

Eighteen members present.

Note on the Enemies of Difflugia.—Prof. Leidy remarked that in the relationship of *Difflugia* and *Amœba* we would suppose that the former had been evolved from the latter, and that its stone house would protect it from enemies to which the *Amœba* would be most exposed. The *Difflugia* had many enemies. I have repeatedly observed an *Amœba* with a swallowed *Arcella*, but never with a *Difflugia.* Worms destroy many of the latter, and I have frequently observed them within the intestine of *Nais*, *Pristina*, *Chætogaster*, and *Æolosoma.* I was surprised to find that *Stentor polymorphus* was also fond of *Difflugia*, and I have frequently observed this animalcule containing them. On one occasion I accidentally fixed a *Stentor* by pressing down the cover of an animalcule cage on a *Difflugia*, which it had swallowed. The *Stentor* contracted, and suddenly elongated, and repeated these movements until it had split three-fourths the length of its body through, and had torn itself loose from the fastened *Difflugia.* Nor did the *Stentor* suffer from this laceration of its body, for in the course of several hours each half became separated as a distinct individual.

Remarks on a supposed Compound derived from Leather.—Prof. Leidy directed attention to a dark-red, compact, shining, resinous-looking mass, several inches in thickness, which, he said, was reputed to have been derived from leather in the great fire of Chicago. It now exhibits no evidence of organized structure, and its origin would not have been suspected from its appearance. On burning it still gives out the peculiar odor of burning leather. It was supposed to be a compound evolved from the leather, under the influence of high heat with absence of air.

APRIL 28.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

On Echinorhynchus moniliformis.—Dr. H. C. CHAPMAN made the following remarks: I take the opportunity of exhibiting specimens of the rare and interesting worm the *Echinorhynchus moniliformis* from the alimentary canal of the Fox Squirrel (*Sciurus vulpinus*) known to occur also in the Hamster and Field Mouse. This species is so called from its resembling a row of pearls; its posterior portion is, however, smooth. The color of the worm is white. The characteristic snout is armed with about a dozen rows of recurved hooks, which enables the worm to hold on to the animal which it infests. This proboscis is retractile, being moved by delicate muscles. The male is much smaller than the female, and can be readily distinguished by the sac at its posterior extremity, which serves as a receptacle for the penis. In this species the testicles occupy only a small portion of the posterior part of the animal, while the ovaries, filled with eggs, extend through the entire length of the body. The female in this species attains a length of eleven inches, the male only that of from four to five. The Echinorhynchus is a member of the Acanthocephali or "Spiney Heads," a family of round worms.

There not being a quorum present for the transaction of business, the meeting adjourned until May 5, when the following were elected members:—

Reuben Haines, G. Schwartz, Galloway C. Morris, John N. Coles, M.D., U. S. Navy, Hugh Hamilton, M.D., and Charles P. Perot.

Don Antonio del Castillo, Don Mariano Bárcena, and Don José Joaquin Arriaga, of Mexico, were elected correspondents.

MAY 5.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

The following papers were presented for publication:—

"On the Habits of some American Species of Birds and other things Ornithological." By Thos. G. Gentry.

"Description of two new Fossil Shells from the Upper Amazon." By T. A. Conrad.

Analysis of Graphite from Wythe County, Virginia. By E. Goldsmith.—Of all the varieties of Graphite that have come under my notice, I have never seen any resembling that which was given to me recently by Mr. John C. Trautwine, C. E. It is compact massive; the touch is smooth. If cut with a knife or scratched with the finger nail, it shows a bright dark metallic lustre. The fracture is rough, uneven, dull. The color is dark blue, so that the mineral greatly resembles the massive earthy vivianite of New Jersey. The powder has the same color.

Talc makes an impression on it, hence its softness is less than one. Lines drawn with it on paper are of a dark gray hue, similar to common soft lead pencil marks. Specific gravity = 2.1068. The blowpipe reactions, as well as my qualitative analysis, showed that beside the carbon a large proportion of silica, alumina, and iron oxides, also a trace of manganese, were present. The mineral contains a considerable amount of gas, the quantity and reactions of which I had not the means to ascertain.

The quantitative determinations of the amount of moisture and gases, the carbon, and ashes were found in the same manner as is usually adopted in the analysis of anthracite.

These were the results:—

Carbon	29.12.
Ashes	60.61.
Gases and moisture . . .	10.27.

Showing that the mineral may be regarded as a very impure graphite.

May 12.

The President, Dr. Ruschenberger, in the chair.

Twenty-seven members present.

Notice of some New Fresh-water Rhizopods.—Prof. Leidy remarked that besides the ordinary species of *Amœba*, which he had observed in the vicinity of Philadelphia, he had discovered what he suspected to be a new generic form. It has all the essential characters of Amœba, but in addition is provided with tufts of tail-like appendages or rays, from which he proposed to name the genus **Ouramœba**.

The rays project from what may be regarded as the back part of the body as the animal always moves or progresses in advance of the position of those appendages. The rays are quite different from pseudopods, or the delicate rays of the Actinophryens.

They are not used in securing food, nor is their function obvious. The *Ouramœba* moves like an ordinary *Amœba*, and obtains its food in the same manner. The tail-like rays are not retractile, and they are rigid and coarse compared with those of Actinophryens. They are simple or unbranched, except at their origin, and they are cylindrical, of uniform breadth, and less uniform length. When torn from the body they are observed to originate from a common stock attached to a rounded eminence.

Several forms of the *Ouramœba* were observed, but it is uncertain whether they pertain to one or several species. One of the forms had an oblong ovoid body about the $\frac{1}{8}$th of a line long and $\frac{1}{12}$th of a line broad. The tail-like rays formed half a dozen tufts, measuring in length about the width of the body. The latter was so gorged with large diatomes, such as *Navicula viridis*, together with desmids and confervæ, that the existence of a nucleus could not be ascertained. The species may be distinguished with the name of OURAMŒBA VORAX.

A second form, perhaps of a different species, moved actively and extended its broad pseudopods like *Amœba princeps.* When first viewed beneath the microscope it appeared irregularly globular and about the $\frac{1}{14}$th of a line in diameter. It elongated to the $\frac{1}{6}$th of a line, and moved with its tail-like appendages in the rear. These appendages formed five tufts about the $\frac{1}{25}$th of a line long. The interior of the body exhibited a large contractile vesicle and a discoid nucleus. This second form may be distinguished with the name of OURAMŒBA LAPSA.

Another *Ouramœba* had two comparatively short tufts of rays, and a fourth, of smaller size than the others, had a single tuft of three moniliform rays.

It is possible that *Ouramœba* is the same as the *Plagiophrys* of Claparede, though the description of this does not apply to that.

Plagiophrys is said to be an Actinophryen, furnished with a bundle of rays emanating from a single point of the body, but the rays are described as of the same kind and use as those of *Actinophrys*. *Plagiophrys* is further stated to be provided with a distinct tegument like *Corycia* of Dujardin, or *Pamphagus* of Bailey, but the body of *Ouramœba* is as free from any investment as an ordinary *Amœba*, and the rays are fixed tail-like appendages with no power of elongation or contraction.

The species of *Ouramœba* were found among desmids and diatomes, on the surface of the mud at the bottom of a pond, near Darby Creek, on the Philadelphia and West Chester Railroad.

Two of the commonest species of *Difflugia* of our neighborhood I had until recently confounded together as *D. proteiformis*, and, perhaps, the two forms may be included under the latter name in Europe. In one the mouth is deeply trilobed, and the animal is usually green with chlorophyl globules. In the other the mouth is crenulate, usually with six shallow crenulations, and the animal is devoid of chlorophyl. The former is usually the smaller, and may be distinguished with the name of D. LOBOSTOMA; the latter may be named D. CRENULATA.

In an old brick pond, on the grounds of Swarthmore College, Delaware County, among *Difflugia pyriformis*, *D. spiralis*, *D. corona*, *D. acuminata*, and others not yet determined, there occurs an abundance of a large species, apparently undescribed. It is sometimes the fourth of a line in length, and is compressed pyriform, but is quite variable in its relation of length to breadth, and in the shape of the fundus of the shell. This is often trilobate, but from the non-production of one or more or all the lobes, differs in appearance in different individuals. The animal is filled with chlorophyl grains, from which it might be named D. ENTOCHLORIS.

Another large *Difflugia*, allied to *D. lageniformis*, is not unfrequent about Philadelphia. The shell is beautifully vase-like in shape. It has an oval or sub-spherical body with a constricted neck, and a recurved lip to the mouth. The body of the shell opposite the mouth is acute and often acuminate. The animal contains no chlorophyl. One shell measured $\frac{1}{6}$ of a line long by $\frac{1}{8}$ of a line broad; another measured $\frac{1}{4}$ of a line long by $\frac{1}{7}$ of a line broad. The species may be named D. AMPHORA.

A Difflugian, found in a spring on Darby Creek, is interesting, from its transparency, which allows the structure of the animal to be seen in all its details. The investment is membranous and apparently structureless. The soft granular contents occupy about one-half of the investment, and are connected with this by long threads. The pseudopods are protruded in finger-like processes. The form of the animal is compressed ovoid, with the narrow pole truncate and forming the transversely oval mouth. It is probably the species *Difflugia ligata*, described by Mr. Tatem, of England. Its length is about $\frac{1}{33}$d of a line. The character of the investment is so different from that of ordinary Difflugians that the species may be regarded as pertaining to another genus, for which the name of CATHARIA would be appropriate.

Dr. CHAPMAN made the following remarks on the *generative apparatus of the Tebennophorus Carolinensis*:—

Various have been the interpretations offered from time to time of the generative organs of the Gasteropoda. Thus Cuvier considered what is now regarded as an hermaphroditic organ to be the ovary. Later observers regarded this hermaphroditic organ as the testicle, and considered what is now supposed to be an albuminous gland the ovary, and which Cuvier regarded as part of the testicle. With reference to these views, I have recently dissected the Tebennophorus Carolinensis, a slug found often in our environs under trees, etc., and found both ova and spermatozoa in the organ regarded first as simply the ovary, later as the testicle. I take the opportunity of acknowledging the assistance afforded me in my dissection by Dr. Leidy's beautiful monograph on the Gasteropoda.

MAY 19.

Dr. KENDERDINE in the chair.

Twenty-five members present.

The Veins of Beech and Hornbean Leaves.—Mr. THOMAS MEEHAN said that De Candolle had noticed some years since a difference in the venation between the *Fagus ferruginea* and *Fagus sylvatica*, the common American and European beeches. In the American beech the lateral veins were said to terminate in the apex of the serratures—in the European they terminate at the base of the sinus. He had not read the original paper of De Candolle, but abstracts in the scientific serials. As the statement stood, it conveyed the idea that there was a marked difference in structure between these two allied species which did not, however, exist, as growing in this country the leaves of the European beech are almost entire; the lateral veins, in approaching the margin of the leaves, curve upwards, and connect with the lateral above them, forming a sort of marginal vein near the outer edge of the leaf. The veins of the American beech curve upward in the same way, but are early arrested, and this sudden cessation of growth produces the serra, which are slightly curved upwards. An early arrestation of growth in the veins makes the serratures, and constitutes the only difference between the two species. The structural plan is the same in both—the European, curving its lateral vein into the apex, reached the upper one—the American terminating abruptly.

There was a greater tendency to marginal development in some European than in allied American species. In the *Carpinus Betulus*, the English Hornbean, there were from four to five teeth between each pair of lateral nerves, while there were but from two to three between those of the American—*Carpinus Americana*—a character that was quite as distinctive between these two very closely allied species, as the viens were in the case of the beech.

Direct Growth Force.—Mr. MEEHAN referred to some potatoes exhibited by him to the Academy a few years ago, in which the stolons of a grass had penetrated through from one side to the other, preferring, as it would seem, to go through such an obstruction to turning aside to avoid it. A potato was a rather rough surfaced body. He now exhibited a similar case, only the obstruction was the round smooth root of an herbaceous peony. Though not more than one-third of an inch thick and round, a stolon of *Triticum repens*, the common couch grass, had pushed itself through.

May 26.

The President, Dr. Ruschenberger, in the chair.

Twenty-three members present.

Thos. Hockley, Wm. A. Stokes, John Shallcross, Alfred G. Reed, M.D., Richard J. Dunglison, M.D., Louis A. Godey, and J. E. Kingsley were elected members.

On report of the Committee to which it had been referred, the following paper was ordered to be published.

DESCRIPTION OF TWO NEW FOSSIL SHELLS OF THE UPPER AMAZON.

BY T. A. CONRAD.

The Pebas group of the Upper Amazon was first discovered by Prof. James Orton in 1867, who obtained a collection of the remarkable shells, some of which were first described by Mr. Gabb. Subsequently, at request of Prof. Orton, Mr. Hauxwell collected other specimens, and Prof. Steere obtained some new species, besides a very large number of several species of PACHYDON. Prof. Orton, having revisited the region in which the Pebas group occurs, has found two new forms which he has forwarded to me to describe. These new shells belong to fresh-water genera, and help to define the nature of the habitat of the group. They confirm the opinion I advanced in the preceding paper, that it was a basin of fresh water to which brackish water had access at times. The HEMISINUS herein described occurs crowded in the clay in such perfection that the species must have lived and died on the spot, and as the living shells of the genus inhabit fresh-water rivers of South America, very far from salt water, they are as much fresh-water shells as are those of MELANIA. Some of the shells are water-worn, and there is abundance of small fragments of shells in the clay, in which respect it resembles some of the Miocene beds of Virginia. The Pebas clay in all the localities is crowded with specimens of *Isæa Ortoni*, *I. lintea*, *Liris laqueata*, all of which I believe to be fresh-water shells of the family *Melaniidæ.*

The two shells described in this paper were found at Iquitos, about 100 miles west of Pebas.

Family UNIONIDÆ.

HAPLOTHÆRUS, Conrad.

Equivalve, hinge margin straight, the cartilage area very broad and thick, hinge edentulous, anterior muscular scar small, narrow, and deeply impressed, accessory situated under the primary scar.

This is a large, very thick shell, laminated and pearly like Unio, and is remarkable for the thick, broad hinge area. It comes in fragments, so that the entire outline is unknown. The anterior accessory scar is differently situated from that in ANODONTA, which is on the posterior side of the primary impression. The latter is very much smaller than in an ANODONTA of the same size.

H. capax. Pl. 12, figs. 1, 2, 3.

Ovate,? thick and ponderous, inflated; umbo prominent, rounded; beaks distant from anterior extremity; valves somewhat contracted near the middle towards the base.

Prof. Orton remarks that he saw many fragments of this shell, and, therefore, it probably lived in company with Pachydon, but the lamina of the shell separate so readily that fragments only are obtainable. The shape of the shell is evidently somewhat like that of a TRIQUETRA.

HEMISINUS, Swainson.

H. tuberculiferus. Pl. 12, fig. 4.

Turreted, elongated, volutions 9, laterally straight; 3 prominent revolving tuberculated ribs on each volution of the spire, except two or three nearest the apex; last volution with 9 or 10 revolving lines, unequal in size; a fine carinated line borders the upper margin of the suture, which is indistinctly defined; aperture short.

A beautiful species, very distinct from any living shell of the genus. It occurs often very perfect, with the exception of the labrum, which is broken, in every specimen I have seen, from the chalky nature of the shell, not generally from attrition.

PACHYDON, Gabb.

P. tenuis. Pl. 12, fig. 5.

Outlines representing extremes of variation.

P. ——. Pl. 12, fig. 6.

As there is only one specimen of this form, I am uncertain whether it is a distinct species or a variety of *P. tenuis*.

In my last paper, for *Mylitoides* read *Mytilopsis*.

JUNE 2.

The President, Dr. **RUSCHENBERGER**, in the chair.

Eighteen members present.

The thanks of the Academy were tendered to Mr. Alfred B. Durand for a life-sized portrait of his father, the late Elias Durand, presented this evening.

Habits of the Orchard Oriole.—Mr. **THOMAS MEEHAN** stated that he was not familiar with the latest knowledge in ornithology, that not being a special study with him; but if *Wilson's Ornithology* contained all that was known of the habits of the orchard oriole—*Oriolus mutatus*—he might say that the bird did not confine itself solely to insect food. He had on his grounds a large specimen of the *Staphylea trifolia*, which, when in bloom, was a favorite resort with humblebees and humming-birds, and the oriole took its share of honey from the flowers as well. It did not rest on the wing as the humming-bird did, but sought a lower branch from which it could leisurely extract the sweets from the flowers above. He had thought it possible that the bird was in search of insects among the flowers, but a careful examination proved otherwise.

Poisonous character of the Flowers of Wistaria Sinensis.—Mr. **MEEHAN** remarked that there was a popular belief that the flowers of the *Wistaria sinensis* were destructive to bees. He had himself seen hundreds of dead bees under large flowering plants. He was struck with the fact this season, that none were dead under similar circumstances. The flowers were continually visited by the honey bee, and others, without, so far as he could see, any fatal results following. It was clear, therefore, that, whatever might be the cause of the death of these insects under some circumstances, it could not be from the honey alone.

Growth of the Cuicus arvensis, Hoff.—In regard to the rapidity with which plants sometimes grew, Mr. **THOMAS MEEHAN** observed that, though it was well known that the Canada thistle spread surprisingly, there had been no figures, giving its exact growth, placed on record. In the first week in May, 1873, he sowed a few seeds. By the first week in June the little plants were well above the ground, and about to push out their stolons. They continued to radiate from this centre in every direction till the first week in September, when they had reached a distance of six feet, covering a circle of twelve feet in diameter, the space being profusely filled with plants thrown up from the creeping stolons. This gave an average of about three-fourths of an inch of growth per day; equal to maize or other rapid-growing vegetation above ground.

JUNE 9.

Prof. Jos. LEIDY in the chair.

Sixteen members present.

Prof. **PERSIFOR FRAZER**, Jr., made the following remarks:—

During a recent trip to Missouri I had an opportunity of visiting and personally examining the Pilot Knob, and Iron Mountain, and Mine La Motte districts, in company with two of the assistant geologists—Prof. Potter and Mr. Gage. There is much in this district, and in fact in most parts of Missouri, to interest the student of geology from east of the Alleghanies: for example, the variations in the character of the porphyry, which is the archæan according to Prof. Pumpelly, or the azoic member of the Missouri series. This porphyry carries several deposits of ore, both veins and beds, as has been ably pointed out in the recent geological survey of the State by Prof. Pumpelly. This, and the magnesian limestones which overlie it, form the principal part of the surface in the southeastern part of the State.

Mine La Motte is situated in St. Francois County, about ninety miles nearly due south of St. Louis. There are extensive works put up on this property, and the whole was sold to an English company two years ago for $3,000,000, but the sale could not be ratified owing to a law of Missouri which prohibits foreigners from holding property in that State. At least such was the information given to me. The deposits of lead and copper and nickel ores at Mine La Motte, part of a great belt about one hundred miles wide which crosses the State from southeast to northwest, lie in the limestone. At Mine La Motte there is a profuse occurrence of nickel-bearing minerals, and especially of millerite, which is found in stellate, acicular, and radial crystals on the surface of many of the lumps of ore.

The works here, before they were burned down, treated the ores in open American hearths, and brought out matt which was shipped to Swansea. It is said, on competent authority, that a galena exhibiting a peculiar blue color (like that found on the surface of much peacock ore), contains cobalt. The cause of this color, and also its connection with the contained metal, are not perfectly understood. Almost all of the galena of the district is colored in this way.

I present also specimens of iron ore from Iron Mountain, Missouri, where it occurs in irregular veins, intersecting the porphyry mountain in all directions. This mountain covers at its base about seventy acres, more or less, and is furrowed by deep cuts near its summit; some of these to a depth of eighty to one hundred feet. The best and purest ore is that which was found lying on the surface of its slopes, and of this there is still a very large quantity; but the large boulders have been almost all removed, while that which remains is so finely divided and so mixed with the clay and soil that any ordinary method of separation would make it too expensive.

Lately, the California hydraulic mining has been applied to win this ore, with great success. Water is pumped through large hoses which are led up the sides of the hills, and the debris is washed down through sluice-boxes and over small falls, which agitate it sufficiently to shake the ore from the dirt and allow it to deposit at the foot of the hill by virtue of its higher specific gravity, in receptacles provided for it. The remaining ore is obtained by blasting, is loaded on a gravity railway and carried to the foot of the mountain, where it is dumped, three or four tons at a time, over a shoot which precipitates it some eight or ten feet, upon the flats of the Iron Mountain Railroad Company, which are awaiting it. The shock as this heavy weight strikes the cars is great enough to cause them sometimes to tilt over on two wheels. How much it increases the wear and tear I was unable to ascertain.

This ore contains from 65 to 68 per cent. metallic iron, associated with 0.031 per cent. to 0.11 per cent. phosphorus and 4 to 4.5 per cent. silica, and a trace of sulphur. The quantity exposed is enormous, but was stated by Mr. David Thomas, of Catasauqua, not to equal in quantity the celebrated Cornwall mines of this State.

The ore from Pilot Knob is much more sandy than that from Iron Mountain. It occurs in a bed dipping with the general dip of the country rock, and inclosed within the porphyry out of which the knob is formed. The formation of this ore is a most interesting study, and the only plausible theory seems to be that of lateral replacement, a case of metasomatism where the porphyry, having become slaty in structure, and less capable of resisting the solvent, has been replaced along the line of strike, and only in such laminated parts. This ore is banded in appearance, and is almost, if not quite, invariably hematite.

JUNE 16.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-five members present.

Notice of some Fresh-water and Terrestrial Rhizopods.—Prof. LEIDY stated that among the amœboid forms noticed by him in the vicinity of our city, there was one especially remarkable for the comparatively enormous quantity of quartzose sand which it swallowed with its food. The animal might be viewed as a bag of sand! It is a sluggish creature, and when at rest appears as an opaque white, spherical ball, ranging from $\frac{1}{8}$ to $\frac{3}{8}$ of a line in diameter. The animal moves slowly, first assuming an oval and then a clavate form. In the oval form one measured $\frac{3}{5}$ of a line long by $\frac{2}{5}$ of a line broad, and when it became clavate it was $\frac{2}{3}$ of a line long by $\frac{1}{8}$ of a line broad at the advanced thick end. Another, in the clavate form, measured $\frac{7}{8}$ of a line long by $\frac{1}{3}$ of a line wide at the thick end. The creature rolls or extends in advance while it contracts behind. Unless under pressure it puts forth no pseudopods, and the granular entosarc usually follows closely on the limits of the extending ectosarc. Generally the animal drags after it a quantity of adherent dirt attached to a papillated or villous discoid projection of the body.

The contents of the animal besides the granular matter and many globules of the entosarc, consists of diatomes, desmids, and confervæ, together with a larger proportion of angular particles of transparent and mostly colorless quartz. Treated with strong mineral acids so as to destroy all the soft parts, the animal leaves behind more than half its bulk of quartzose sand.

The species may be named AMŒBA SABULOSA, and is probably a member of the genus *Pelomyxa*, of Dr. Greef (*Archiv f. Mik. Anat.*, x, 1873, 51).

The animal was first found on the muddy bottom of a pond, on Dr. George Smith's place, in Upper Darby, Delaware County, but has been found also in ponds in New Jersey.

When the animal was first noticed with its multitude of sand particles, it suggested the probability that it might pertain to a stage of life of *Difflugia*, and that by the fixation of the quartz particles in the exterior, the case of the latter would be formed. This is conjectural and not confirmed by any observation.

A minute amœboid animal found, on *Spirogyra*, in a ditch at Cooper's Point, opposite Philadelphia, is of interesting character. The body is hemispherical, yellowish, and consists of a granular entosarc with a number of scattered and well-defined globules, besides a large contractile vesicle. From the body there extends a broad zone, which is colorless and so exceedingly delicate that it requires a power of 600 diameters to see it favorably. By this zone the animal glides over the surface. As delicate as it is, it evidently possesses a regular structure, though it was not resolved under the best powers of the microscope. The structure probably consists of globular granules of uniform size alternating with one another, so that the disk at times appears crossed by delicate lines, and at others as if finely and regularly punctated. The body of the animal measures from $\frac{1}{66}$ to $\frac{1}{50}$ of a line in diameter, and the zone is from $\frac{1}{333}$ to $\frac{1}{200}$ of a line wide. The species may be named AMŒBA ZONALIS.

The interesting researches of Prof. Richard Greef, of Marburg, published in the second volume of Schultze's *Archiv f. Mikroskopische Anatomie*, on Amœbæ living in the earth (*Ueber einige in der Erde lebende Amœben, etc.*), led me to look in similar positions for Rhizopods.

In the earth about the roots of mosses growing in the crevices of the bricks of our city pavements, in damp places, besides finding several species of *Amœba*, together with abundance of the common wheel-animalcule, *Rotifer vulgaris*, I had the good fortune to discover a species of *Gromia*. I say good fortune, for it is with the utmost pleasure I have watched this curious creature for hours together. The genus was discovered and well described by Dujardin, from two species, one of which, *G. oviformis*, was found in the seas of France; the other, the *G. fluviatilis*, in the River Seine.

Imagine an animal, like one of our autumnal spiders stationed at the centre of its well-spread net; imagine every thread of this net to be a living extension of the animal, elongating, branching, and becoming confluent so as to form a most intricate net; and imagine every thread to exhibit actively moving currents of a viscid liquid both outward and inward, carrying along particles of food and dirt, and you have some idea of the general character of a *Gromia*.

The *Gromia* of our pavements is a spherical cream-colored body, about the $\frac{1}{16}$th of a line in diameter. When detached from its position and placed in water, in a few minutes it projects in all directions a most wonderful and intricate net. Along the threads of this net float minute naviculæ from the neighborhood, like boats in the current of a stream, until reaching the central mass they are there swallowed. Particles of dirt are also collected from all directions and are accumulated around the animal, and when the accumulation is sufficient to protect it, the web is withdrawn and nothing apparently will again induce the animal to produce it.

From these observations we may suppose that the GROMIA TERRICOLA, as I propose to name the species, during dry weather remains quiescent and concealed among accumulated dirt in the crevices of our pavements, but that in rains or wet weather the little creature puts forth its living net which becomes so many avenues along which food is conveyed to the body. As the neighborhood becomes dry, the net is withdrawn to await another rain. The animal with its extended net can cover an area of nearly half a line in diameter. The threads of the net are less than the $\frac{1}{30000}$th of an inch in diameter.

Remarks on the Revivification of Rotifer vulgaris.—Prof. LEIDY remarked that during the search for Rhizopods, having noticed among the dirt adhering to the mosses in the crevices of our pavements many individuals of the common wheel-animalcule, *Rotifer vulgaris*, he had made some observations relating to the assertion that they might be revivified on moistening them after they had been dried up.

Two glass slides, containing, beneath cover glasses, some dirt, exhibited each about a dozen active living Rotifers. The glass slides were placed on a window ledge of my study, the thermometer standing at 80°. In the course of half an hour the water on the slides was dried up and the dirt collected in ridges. The next morning, about twelve hours after drying the slides, they were placed beneath the microscope. Water was applied and the materials on the slides closely examined. On each slide a number of apparently dried Rotifers were observed. These imbibed water and expanded, and some of them in the course of half an hour revived and exhibited their usual movements, but others remained motionless to the last.

The same slides were again submitted to drying, and from one of them the cover glass was removed. They were examined the next day, but several hours after moistening them only two Rotifers were noticed moving on each slide.

I next prepared a slide on which there were upwards of twenty actively moving Rotifers, and exposed it to the hot sun during the afternoon. On examination of the slide the following morning, after moistening the material, all the Rotifers continued motionless, and remained so to the last moment.

From these observations it would appear that the Rotifers and their associates became inactive in comparatively dry positions and may be revived on supplying them with more moisture, but when the animals are actually dried they are incapable of being revivified. Moisture adheres tenaciously to earth, and Rotifers may rest in the earth, like the *Lepidosiren*, until returning waters restore them to activity.

Prof. COPE mentioned the capture of a young *Balæna cisarctica*, of forty-eight feet in length, in the Raritan River, near South Amboy, on May 30th. The skeleton was buried and would be preserved in some museum. He examined the whalebone, of which there are 245 laminæ on each side of the mouth. The color is black and the hair is fine, long, and has a brownish tinge; length of longest plate with hair, 48 inches. The gum is 116 inches long and 11 inches deep. He was informed that the whale was entirely black, and the dorsal line without irregularities.

Prof. COPE exhibited mounted crania of some gigantic horned mammalia of the Miocene of Colorado, viz., the *Symborodon bucco*, *S. altirostris*, *S. acer*, *and S. trigonoceros*. He explained the distinctive features of this genus as compared with *Titanotherium*, exhibiting typical specimens of the latter from the Academy's museum, showing four inferior incisor teeth, while the lower jaw of *Symborodon* does not possess any. He pointed out that these animals had small brains, with few convolutions, which were separated by deep fissures occupied by thin bony laminæ, and that the falx and tentorium are well developed. He pointed out the relatively small size of the brain, and that at least half of the length of the cranium is occupied by enormous, undivided frontal sinuses. Each of these communicates with the nasal meatus by an elongate foramen, and enters the base of the corresponding horn core. He stated that similar sinuses exist in the cranium of *Eobasileus*, and enter the basis of the middle pair of horns in the same manner.

June 23.

The President, Dr. Ruschenberger, in the chair.

Twenty-one members present.

On the Pelvis of Hadrosaurus.—Prof. B. Waterhouse Hawkins, having completed his model of Hadrosaurus at Princeton College, took the occasion to call the attention of the Academy to his success in placing certain fugitive bones belonging to Hadrosaurus, and also to its English cousin Iguanodon. It might be allowable to remind the meeting of the fact that in 1868, when he had made and presented the restoration of Hadrosaurus now in the museum, he then recognized the homologous character of a bone described by Dr. Leidy in his monograph of the Cretaceous Reptiles, to that which had become a fugitive bone in Iguanodon, the English representative of Hadrosaurus. These bones had been for many years appointed to the place of clavicles by Prof. Owen and Dr. Mantel, of England. When Mr. Hawkins made his large restoration of Iguanodon at the Crystal Palace, in 1853, his first difficulty was to find room for these so-called clavicles in his model, a task which he was obliged to abandon, as they were twice the size which the natural arrangement of the limbs rendered possible. A few days previous to his sailing for America he found that Prof. Huxley had been studying the same problem of their true position in the animal's body, concerning which he delivered an address before the Royal Institution. Prof. Huxley, on this occasion, transposed the pseudo-clavicles from the pectoral to the pelvic arch, where he arranged them either as pubic or ischiatic bones, and placed them as in the ostrich and rhea. At the same time this transposition was taken advantage of to suggest the probability of Iguanodon walking on its hind legs, thus accounting for some of the larger forms of bipedal footprints, and justifying the establishment of the new order Ornithosauria. On the arrival of Prof. Hawkins in America, after studying Dr. Leidy's description of Hadrosaurus, he found that Dr. L. had anticipated

Prof. Huxley's transposition of the pseudo-clavicles, which he suggested in the above-named description might more probably represent the ischiatic bones of Hadrosaurus. While engaged in the Central Park, in developing the external form of this former inhabitant of New Jersey, Mr. Hawkins found it necessary to renew the whole question as to the component parts of the pelvic arch of these giants, which he practically tested with casts from the actual fossils, endeavoring to ascertain their true position according to both Dr. Leidy's and Prof. Huxley's views. In this attempt he utterly failed, finding it impossible to place these fugitive bones in such relationship to the gigantic femur as would enable either animal to make footprints similar to those found both in England and America. This being the case at the moment when the iconoclastic Central Park Commission declined allowing the further prosecution of paleozoic studies in the Park, the inquiry was not continued until the opportunity was afforded by the trustees of the New Jersey College at Princeton, who desired to possess for their new museum one of Mr. Hawkins's restorations of an extinct animal of New Jersey. For this purpose they selected Hadrosaurus, which enabled Mr. H. to again investigate the true position of the bones in question, which he has finally placed as the analogues of the abdominal plastron-like supports, found largely developed in the pelvic region of the alligator. This position of the bones, when united with the bipedal carriage of the body, suggested immediately an analogy between these fugitive bones and marsupial bones of the Didelphidæ. These remarks were illustrated by Mr. Hawkins in his usual manner by crayon drawings on the slate.

Prof. Cope stated that he was still of the opinion that the evidence derived from *Lælops* and *Megadactylus* rendered it necessary to believe in the backward direction of these bones in *Hadrosaurus*.

Prof. Cope described a species of Dipnoan fish of the genus *Ctenodus* from the coal measures of Ohio, based on specimens placed in his hands by Prof. Newberry, as follows:—

The top of the head is covered with angular plates or scuta, arranged in the following manner on the region presented. Two symmetrical scuta occupy the median line, one in front of the other. One of these is a longish coffin-shaped hexagonal, with the suture with the other concave. The latter is more ovoid, broad and convex next the first mentioned, and somewhat more contracted at the opposite extremity. Beyond this are two shields joining by a straight suture on the middle line; besides this one, they have two concave sutures for scuta, at the farther end two concave lateral sutures, and a straight one to the adjoining median scutum, whose suture is also concave. On each side of this median plate is a large area surrounded before outwards, and behind, by smaller scuta, three in front, two at the side, and two behind. Commencing with the first, No. 1 has already been described. No. 2 is small, oval, and antero-posterior; No. 3 is an antero-posterior pentagon, with the narrowest side inwards. No. 4 is a similar transverse pentagon. No. 5 is an antero-posterior pentagon, which presents its shorter lateral facet inwards. No. 6 has a similar character, but is smaller and with more definite angles. Another series of scuta is seen outside of these at one end of the series. Three of this set bound the front and side of each of the median pair above mentioned, leaving a short facet next its fellow unaccounted for. The sculpture consists of radiating ridges and tubercles, which are most broken near the centres of the scuta. The tubercles and ridges are obtuse and low, and the latter do not inosculate. An angular depression commenced at the middle of each lateral area, and extends across the middle line at the point of junction of the paired and single median scuta.

	M.
Width of vertex at middle scuta	0.176
Length of single median scute	.048

June 30.

The President, Dr. Ruschenberger, in the chair.

Fifteen members present.

Permission having been granted (the meeting being for business), Prof. **Persifor Frazer, Jr.**, made the following remarks:—

In the investigation of the chemical formulas of minerals, the student will meet with two kinds of difficulties. The first is the great variations in the analysis, and the next is the connecting together in the formula for the particular mineral of different compounds by the sign $+$. The first of these difficulties is a necessary consequence of the manner of formation and occurrence of minerals in the midst of solutions of other materials, and consequently subjected to mechanical and chemical conditions tending to add impurities to it, (whether by percolations through its open joints, crevices, and pores, or by oxidizing or partially decomposing it).

The first results of the best processes of mechanical separation merely reduce to a low per cent. the admixture of one mineral with another of greatly different sp. gr., and even the best known chemical methods can never succeed in producing an absolutely and theoretically pure substance. So much less probable is it that the deposits of compounds by the mechanical and chemical processes which a change of the conditions of the surrounding nature have caused, and which have not been bottled up in impervious glass jars, but left to the action of the rain and sun and subterranean solutions, should even acquire more than a relative purity. So that when we glance over the analysis of the same mineral made by different chemists, it is often hard to say which elements are those characteristic of the species. (*See Glauconite*, *Conarite*, *Beudantite*, *etc. etc.*)

In some cases, the admixture of the two minerals can be proved to be mechanical (*gold dust in magnetic sand*); in others it is merely strongly suspected, but the mineral cannot be separated by mechanical means (*gold in pyrites*, *etc.*), while in the great majority of cases the formula maker contents himself with two arrangements of the atoms present connected by the sign +, and each representing a different mineral.

It is this that forms one of the greatest difficulties to the student, at the present state of science, in forming any probable conception of the mutual chemical relations of the various elements represented. Such an hypothesis is certainly tenable in two cases: 1st. When the resulting mass cannot be classed under any of the crystal systems (*limonite*, *etc.*) and the mineral is set down as amorphous or crystalline; and 2d. Where the percentage of one or two of the supposed compounds is so small that the morphological properties of that which greatly preponderates are assumed by the whole mass. (*Quartz containing scales of specular iron or needles of rutilite.*) But when a mineral crystallizes distinctly in one crystal system and is deliberately assumed to be made up of two others, each crystallizing in a different one, the case is exceedingly perplexing to the mind. Yet the greater number of all the formulas determined by chemists exhibit this anomaly.

It was not surprising that this should be the case at a time when the electro-polar theory of Berzelius was unquestioned, and the bases and acids were placed opposite each other—frequently separated by the + sign—like the partners in a Virginia Reel, and it was thought necessary to make them analogous by dividing the oxygen between them. CaO, SO_3 (*anhydrite*) or $CaO + SO_3$ which has a crystal form differing from that of SO_3 and CaO seems to justify $(Ag_2S)_3 + Sb_2S_3$ (*proustite*), for in this latter case the mineral is rhombohedral (hexagonal) while one of its constituents crystallizes isometric and the other rhombic. It is true that this mineral belongs to the class of those of metallic habit, and is therefore opaque, and thus its optical properties cannot be determined, but if it were transparent we should be under the necessity of recognizing the power of a mineral which can only produce the ordinarily refracted ray + one that can produce two extraordinary rays to form a mineral which can give rise to one extraordinary ray, and so of pleochroism, etc. In this case the fancy is pleased by the accidental coincidence of the crystal form of the resultant with the average of the other two $\frac{0+2}{2} = 1$; but we know there is no basis for such a thought, and besides in other cases the union of two simply crystallizing minerals produces one of more complex morphology.

Thus our authorities tell us that sternbergite which crystallizes orthorombic is to be written chemically $Ag_2S + (FeS)_3 + FeS_2$, or in other words, is composed of three minerals, two of which (*Ag_2S and FeS_2*) crystallize in the isometric system, and the third has no place in nature and no name.

I propose at a future meeting of the Academy to call the attention of the mineralogists to several formulas which, though new, seem to fulfil all the conditions of agreement with analysis and the newest developments of theoretical chemistry.

The following anatomical notes by Dr. CHAPMAN were read:—

Disposition of the Latissimus Dorsi, etc., in Ateles Geoffroyi (Kuhl) and Macacus Rhesus (Desmarest).—Frequently the attention of anatomists is called to the abnormal arrangement of parts, such as variations in the disposition of muscles, arteries, etc., and by comparison with other animals what is abnormal, variable, in a higher animal is usually found to be normal, constant, in a lower one. Supposing the theory of the evolution of life to be true, that the higher animals are the modified descendants of the lower, we have some explanation for the occurrence of such abnormalties, these variations being reversions to ancestral types. An interesting illustration of this view is seen in the occasional occurrence in man of a muscular slip, running from the latissimus dorsi to the internal condyle of the humerus. This muscle, which is of very rare occurrence in the human subject, is constant in monkeys, among others in the spider monkey or Ateles, as shown in Plate 13, Fig. 1 (*b*). Another variation met with so frequently in the human subject that surgeons have their attention called to it with reference to the ligation of the main arteries, is the presence of a muscular slip, passing from the latissimus dorsi across the axillary artery and nerves to the pectoralis major. This muscle, Plate 13, Fig. 2 (*c*), is constant in the Macacus, which also exhibits the muscular slip (*b*), just referred to in Ateles. On the supposition that man and the monkeys are the descendants of a common stock, we may expect to find such variations recurring like other family traits.

Flexor Brevis Digitorum in Ateles Geoffroyi (Rube).—I take the opportunity of calling attention to the arrangement of the flexor brevis digitorum in a spider monkey, the Ateles Geoffroyi. By looking at Plate 14, we see that tendons 1 and 2 are the continuation of the muscular belly rising from the calcaneum, that tendon 3 results from the union of two muscular slips, one from (*a*), the other from the tendinous portion of the flexor longus digitorum, while tendon 4 comes only from tendon of flexor longus digitorum. This arrangement of the tendon of the flexor brevis digitorum is somewhat different from that observed in other New World monkeys (Platyrrhini and Arctoppithecini) or those of the Old World (Catarrhini).

Rete Mirabile in Bradypus Didactylus.—Of the many peculiarities in the organizations of the sloths, one of the most interesting is the breaking up of the arteries into rete mirabile. This is well seen in the upper extremity of a two-toed sloth (*Bradypus Didactylus*) which recently died at the Zoological Garden, Philadelphia. While the axillary artery is seen to continue its course as the brachial, diminished, however, in its calibre, it gives off numerous branches which divide and subdivide. The main artery with the surrounding plexus and the median nerve passes through the internal condyle of the humerus, Plate 13, Fig. 3. In this latter respect it differs from the three-toed sloth, as may be seen by comparison with the beautiful plates of Prof. Hyrtl. This interesting disposition of the bloodvessels is also seen in the femoral arteries of these animals. Various explanations have been offered for the rete mirabile of arteries. Thus in the Cetacea the dividing and subdividing of the arteries appear to serve as reservoirs of arterialized blood, enabling such animals as the porpoise, etc., to remain for a long time under water. In the sloths and slow lemurs this disposition of the bloodvessels seems to be in relation with the slowness of the circulation, fluids travelling less rapidly through a number of small vessels than one large one.

On report of the Committee to which it was referred, the following paper was ordered to be published:—

ON HABITS OF SOME AMERICAN SPECIES OF BIRDS.

BY THOS. G. GENTRY.

The body of facts contained herein is the result of observations carried through a period of four consecutive seasons, and is confined to species which, though of extended range, breed within the State of Pennsylvania. This paper is designed to cover the ground from the Family Icteridæ to the end of the Family Picariæ, exclusive of western species and a few whose habits have been described by the writer in the forthcoming work of Dr. Coues.

Family ICTERIDÆ.

Subfamily AGELÆINÆ.

Molothruis pecoris, Swainson.

This well-known species, though an early visitor in Massachusetts, which, according to the authority of Samuels, makes its appearance there as early as the middle of March, from some cause or other has never been observed by the writer earlier than the second week of April, long after the blue-birds, robins, and blackbirds have made the fields and woods resound with their music. Its arrival is announced by the coming of the warblers and sparrows, between whom and it exists such mysterious relations. The anomalous habit which the female possesses of visiting the nests of smaller species of birds when she wishes to deposit her eggs, and thus shifting a responsibility which she should alone assume, is familar to all. There is no doubt that primitively all species were as equally social and gregarious in their habits as the cow-bird of to-day; and that the present system of mating, which is surely an index of a high state of improvement, has been gradually evolved. The art of nest-building has doubtless also been slowly acquired. In some families it has attained a wonderful degree of perfection, while in others it may be said to be in its infancy. With the cow-bird either it has never been studied, so to speak, or else it is a lost art which the species has never been able to regain.

The species of birds which seem to be the objects of its special regard, are comprehended within the three great families of the *Sylvicolidæ*, *Vireonidæ*, and *Fringillidæ; Geothlypis trichas*, Cab.; *Vireo olivaceus*, Vieil.; *V. novaboracensis*, Bonap; *Cyanospiza cyanea*, Baird; and *Melospiza melodia*, Baird. Why the small birds should be the recipients of such unsolicited favors it would be difficult to guess, unless the cowardly spirit of the species under consideration operates to prevent similar discourtesies being shown where they would probably be resented. As a proof of said cowardice, might be cited the stealthy manner in which the female approaches the nest of any of the above species. She is ever on the alert for fear of detection by the rightful owners. In case of discovery she takes to flight, sometimes failing to complete her work; but when suddenly pressed, she is compelled to drop her egg. This will account for the eggs which are occasionally seen either entire or broken upon the ground. It is said that the egg of the cow-bird hatches rather sooner than those of the birds among which it is found, and from this it is argued by some, that it is a wise provision of nature, which, were it otherwise ordered, would defeat the end she had in view. The writer knows from experience that sometimes a nest of eggs is a longer time in hatching than at others; the difference of time being the evident result of variation in the amount of heat to which they are subjected. Now, the egg of the cow-bird being perceptibly larger than the others, would receive more heat from the body of the female than the latter's own, for the simple reason that it is in closer proximity to the source of heat. This seems to be a satisfactory explanation of its much shorter period of incubation. Were the eggs hatched by their rightful author, there is no doubt that the time would vary but a trifle, if any, from that of the rusty black-bird.

Agelaieus phœniceus, Vieil.

At the time of writing, March 24th, not a single individual of this species is to be seen, while the purple grakle is found in prodigious numbers. About the first of April is the usual time of its appearance with us. Like the crow-black-bird, it is fond of society, many pairs being observed building within a few paces of each other in the same swamp or meadow. Occasionally a nest is constructed within a tussock of grass, but generally upon the alder bushes so common along the borders of meadow streams, where the eggs and young are less liable to the attacks of snakes, particularly *Bascanion constrictor* and *Tropidonotus sipedon* which seem to have such a decided penchant for such fare.

In structure those found upon bushes are finer and more compact. On the exterior are observed occasional patches of mud. While those built upon the small mounds in swampy situations are surrounded by tall overarching grasses, and have in consequence a looseness of arrangement which in general will scarcely bear manipulation.

In the selection of a locality there is manifest an evidence of design. High grounds are seldom chosen for nidification, for the obvious reason that the birds are not so apt to meet with such a ready and full supply of the various species of insects which pander to their appetites and those of their young as in the former situations. The insects which afford them a living in such localities, are the aquatic larvæ of ephemerids, dragonflies, and mosquitoes which are found in the small shallow pools so abundant therein; together with mature forms of the same—a variety which the most fastidious *bon vivant* among the *aves* cannot fail to appreciate.

It has been affirmed that the red wings are destructive to farmers' crops, but as far as the writer's experience extends, the damage which they do is small in comparison with the good which they accomplish. When a cornfield is in close proximity to a meadow, it is probable that a few grains may be exhumed, or a few tender shoots uprooted, in early spring, but I am certain that the birds during the breeding season are so strongly attached to the meadows that they are reluctant to leave them. In the fall of the year they may visit the cornfields and pluck a few grains from the standing shocks, but in view of the manifold advantages gained by the myriads of insects destroyed, we should not grudge them a mere pittance of corn, since, at this season of the year, they are doubtless productive of immense good in the destruction of various coleopterous and lepidopterous larvæ.

Sturnella magna, Swainson.

This beautiful species, though quite common in this latitude during the breeding season, according to the writer's observations makes its appearance from the first to the fifteenth of April. It is not gregarious in early spring like the purple grakle, but arrives from the south already paired for the essential duties of nidification and incubation. It does not commence building operations, however, earlier than the last of April or the beginning of May; the interval of time being employed, judging from the manœuvres of the birds, in the selection of a desirable and suitable locality. The site chosen is, as is well known, a meadow. Samuels affirms, "the locality is generally in a meadow or low field." I have as often found the nest on upland in a field of red clover or one of timothy grass. In such situations it reposes in a concavity of the earth, partially hidden and protected by enveloping and over-arching grasses. Nuttall's description thereof, though correct in his day, according to the writer's experience needs some modification. As the nest of the same species varies with a change of locality, this difference may be attributed thereto. According to that eminent authority "it is compact, made of wiry grass, to which a hidden and almost winding path is made, and generally so well concealed that the nest is only to be found when the bird is flushed." I have always observed a looseness of arrangement in its structure. The materials out of which it is built are the hollow stems and leaves of *Phleum pratense*. These are accumulated principally in the bottom, to insure protection against the dampness of the ground.

It is seldom that the hen bird can be detected on the nest. When alarmed by approaching footsteps, there is no sudden uprising or whirring of wings as is usual. Aware of danger, she quietly slips out of the nest and noiselessly wends her way through the thicket of grasses, along well-beaten paths which she has made for the purpose.

The food of the meadow lark consists chiefly of larval insects, together with earthworms, beetles, grasshoppers, and the seeds of grasses. Nuttall says it does not appear that it ever adds berries or fruits to its bill of fare. The writer is confident he has seen it feasting upon the small black cherry which is so plentiful during the month of June. The period of incubation is from 14 to 15 days according to various observations.

Subfamily ICTERINÆ.

Icterus spurius, Bonap.

The orchard oriole is quite as common as its near relative. It reaches us from the genial South about the first of May. Samuels, in describing its nest in Massachusetts, says substantially, it is deposited on a forked branch of a tree in an orchard, at an elevation of not more than twenty feet from the ground, and constructed of different grasses neatly and compactly woven together; the whole being lined with fine grasses and a few hairs. Further, he says, "it is not pensile but built *on* a branch." Its style of architecture varies no doubt with the latitude. Of the many nests which have been examined, including many in the writer's collection, all with but one or two exceptions were of a decidedly pensile character; uniform in texture, and suspended from slender branchlets after the fashion of *Icterus Baltimore*, Dandin. The exceptional cases were placed between the forked branches of trees. These nests, with two exceptions, have been found upon apple and pear trees, in close proximity to the residence of man; the exceptions were noticed on the confines of forests, at considerable distances therefrom. There is no doubt that in earlier times this oriole was as timid and suspicious of man as many other species that might be cited; and that as time advanced it gradually lost all fear. Familiarity with man, the result no doubt of many years' experience, has taught it to regard him in the light of a friend. In the fact that the nest of this species is occasionally found on the borders of immense thickets, we have a clue to its past history. In the writer's opinion, reserve, timidity, and distrust were then the leading elements of its character, while familiarity, a certain degree of boldness and confidence are traits which now stand prominently forth.

A typical nest of the species measures 2½ inches in diameter and 4½ inches in depth. It is pouch-shaped, and attached to the slender twigs of an apple or pear tree in such a manner as to be swayed to and fro by the gentlest breeze. It is built of the soft and flexible leaves of a species of *Poa*, neatly and compactly woven together, and lined on the inner side with much narrower leaves of a closely allied species. The site selected is usually one where the small spurs of the pear and apple, principally the former, with their crowns of leaves can meet over the nest and form a roof to protect the female and young from inclement weather.

During the breeding season its chief food is beetles, flies, lepidoptera, earthworms, and various larvæ. The seeds of grasses are occasionally relished. It is highly insectivorous in its nature. I am not able to say whether it has a fondness for fruits and berries, but am inclined to the belief that it will not refuse a juicy berry if thrown within its way; but that it will not put itself to any inconvenience to obtain the same I am well aware.

In the duties of incubation the male takes no direct part. I have often observed him bringing food to the female while thus engaged. When the young have developed from the egg, both parents are extremely sedulous in their attention to them until they have attained their feathered stage, when the mother seems to hand them over to the father to initiate into the mysteries of aerial navigation. There is but one brood in the season, as far as I have been able to determine, although I have seen nests in the early part of August with rather tender fledglings. The period of incubation ranges from fourteen to fifteen days.

Family CORVIDÆ.

Corvus Americanus, Audubon.

The above species is very abundant throughout the summer in this section of the country, and the writer has observed through the severest winter weather numberless individuals roosting in the junipers and cedars of the hills of the Wissahickon, when the snow stood several inches upon the ground. The birds commence pairing about the last of April, seldom earlier than the fifteenth, and shortly afterwards commence building. The nests are usually built upon the various species of oaks, and occasionally upon some of Pinus. They are large in dimensions, fully 18 inches in diameter at the base, and from 8 to 10 inches in depth; the thickness of the walls is from 3 to 4 inches. They are constructed of coarse rude sticks externally, of the thickness of a lady's ring finger, mostly fragments of dead branches that had fallen from the oaks and chestnut. Within are smaller twigs of the same covered by a few dried leaves of *Quercus* and *Fagus* to relieve its hardness. All the nests that I have examined, and I have had abundant opportunities, answer to the above description, which will be found to differ materially from others. Usually but one brood is reared in a season; the writer has met with two, but this is of rare occurrence.

Nests have been taken close by the dwellings of man, showing the friendly disposition of the authors. Usually the species is very shy and builds in places seldom visited. When with young the birds are very pugnacious, permitting no intrusion within their jurisdiction. They manifest the most tender regard for their progeny, and exercise the most jealous care over them. Notwithstanding the mischief they commit to the farmers' crops, and their frequent raids to the poultry yards, the good which they accomplish in the destruction of noxious insects and small animals should commend them to public favor. Besides subsisting upon insects, small animals, carrion, grass, and fruits, I have in two instances observed individuals, which I took to be males, imitating the habit of their nearest kin, the fish crow, by plying the trade of fishers. There is no doubt that in the case of *Corvus ossifragus*, this habit was similarly acquired by a few birds of more sagacity than others. The period of incubation I have not satisfactorily determined, but am confident that it cannot exceed eighteen days.

Corvus ossifragus.

This species, though assigned to the South Atlantic and Gulf States by Dr. Coues in his Key to North American Birds, has been observed by the writer during the past four years to breed within the rural districts of Philadelphia. Although designated by the same great authority as a maritime species, yet it should be considered only partially so. It has been observed in company with its near relative the common crow, and commences building at the same period. Its nest, unlike that of the crow, is constructed upon a willow, by the side of a watercourse, where it can ply its piscine trade without being molested. Externally, it consists of a few rude sticks as a sort of foundation, upon which a neat and comfortable superstructure, composed of the inner fibrous parts of the red cedar, is placed, loosely arranged, the whole presenting a neater and more fastidious appearance than that of the common crow. The eggs are four in number. The ground-color is a light blue marked with a few dots and blotches of umber-brown on the small end, which are more or less confluent on the large one, obscuring to a considerable extent the background. In size they are but little superior to the eggs of the purple grakle, being about 1.40 in. in length, and .89 in width. In configuration they bear a very close resemblance to those of the great crested Fly Catcher, being almost perfectly oval. There is a marked contrast between the eggs of *ossifragus* and *Americanus* in size, shape, and markings, sufficiently striking to convince one of the distinctness of the two species, even though other details should be wanting. I have never met with more than one brood in a season. It is like its cousin in some points of character, but minus its thievish propensities. A fisher by trade, it holds all other occupations at a discount. It is fond of its young, but has not the courage to defend them against the attacks of enemies, as the former. Since it breeds usually in out-of-the-way situations, it can give farmers and others but little annoyance. Its period of incubation is similar to that of *Americanus*.

Family TYRANNIDÆ.

Tyrannus Carolinensis, Baird.

The Bee Martin, shortly after its arrival in the latter part of April, commences building. Its nest is ordinarily constructed upon the forked branches of a pear tree in an orchard, or in close proximity thereto. Why the pear tree should be selected in preference to any other, the apple and cherry for examples, it is difficult to imagine, unless the density of its foliage, and the short spine-like twigs with which the branches are armed, afford greater protection; the former from the keen gaze of rapacious birds, and the latter from mischief-seeking and mischief-loving boys. It is usually built near the top of the tree where the denser foliage is found. Occasionally, I have taken nests of this species in places remote from orchards, on the confines of thick forests, a fact which seems to intimate that the habit of building in orchards is an acquired one, brought about in obedience to a change of character in the species. As it has a passion for the little *Apis mellifica* whose hives are found in such situations, there is no doubt that a desire to be near such articles of luxury may have prompted a change, thereby saving unnecessary waste of time in procurement, and giving a better guarantee of success. It is true that the species is proverbial for its pugnacity and pertinacity, not even fearing to attack birds of prey which come within the precincts of the ground over which it exercises sway, and, therefore, the securities which a pear tree throws around are not absolutely necessary. But birds of the least sagacity would not be slow to perceive the advantage which would be gained by the selection of such a site, in the saving of great physical labor. In the vicinity of forests these protective objects are in a measure denied, the birds in consequence making up in bravery. Perhaps a vivid sense of greater danger to their young induces them to give them the advantage of everything protective that wisdom and ingenuity can devise. There is one feature about the nests which have been found in regions unoccupied by man that has not been observed in those adjoining his residence: the entire absence of feathers and hairs in the interior; these articles being substituted by fine grasses and leaves. The period of incubation ranges from 13 to 14 days according to circumstances.

Myiarchus crinitis, Cab.

This species is very abundant in this latitude, arriving from the South during the early part of May, and shortly afterwards pairing. Both birds engage in nest building. The nest is constructed in a hollow tree, mostly a pear or an apple; no doubt the previous labor of some hard-working wood-pecker, possibly *Colaptes auratus*. Mr. Samuels says, "the nests are composed of straws, leaves, feathers, and the cast-off skins of snakes." He further affirms, "it seems a distinguishing characteristic of the nests of this species, to have the skins of one or more snakes woven into the other materials." This has also been the experience of others. Mine has been quite different. I have yearly collected many nests of this species, and find a great difference in the materials. The following is the aggregate description: Loose in arrangement, with scarcely the slightest evidence of design. To an observer, it seems as if the materials had been dropped into the cavity by the birds, and, when a sufficient quantity had been accumulated, the whole had been shaken together until the ingredients had been thoroughly commingled. Dried grasses, liber of trees, rotten wood, and feathers are the chief constituents; the slough of snakes being an unnoticeable feature. In lieu thereof, I have always found the feathers of the common barnyard fowl to be a characteristic feature thereof.

That this species does not always build in cavities is certain. Two years ago, near Germantown, I found a nest built between the forked branches of an apple tree. It was composed principally of the feathers of chickens, held in place by a woof of long grasses. Though not very compact, yet it was sufficiently so to last during the season. It is doubtful, however, whether it could withstand the peltings of winter. The habit of building within the hollows of trees is doubtless an acquired one, rendered necessary by external circumstances. That species do occasionally vary in the selection of a site for a nest, is instanced by *Turdus migratorius*, Lin., which, as is well known, ordinarily builds its mud-plastered nest within the forked branches of a tree. In the case to which the writer refers, the nest was found upon the horizontal beam of an outhouse, to which the rafters are attached, after the manner of *Sayornis fuscus*, Baird. The case of *M. crinitus* cited above seems to the writer to be a case of reversion of habits.

Why this species alone of all others of the family to which it belongs should seek shelter and protection for its young in the hollows of trees, is hard to divine. We should expect to see in its structure a family resemblance. It is true that it is of a quarrelsome disposition, and as a necessary consequence, gains many enemies. To insure protection for its young against the latter's attacks, it has hit upon the happy expedient of hiding them away in the places designated.

The feathers selected for the nest are mostly white, or of a grayish color, which, with the characteristic hue of the inner bark of trees and the rotten wood that form the bulk of the nest, resemble so closely the ground color of the egg and its markings, that great advantage is gained thereby. The food of this species is mostly bees, beetles, grasshoppers, and lepidoptera. Perched upon a dead branch of a tree, the writer has observed the male bird, for hours, bobbing the head this way and that, then up and down, always on the alert for the beings which form its appropriate diet. During the period when the species is with young, may be noticed similar practices, which, however, are not so prolonged, for the male bird after brief periods of time repairs to the nest with its spoils, which are dealt out to the female and the young according to the character of the food. The period of incubation ranges from 13 to 14 days.

ORDER PICARIÆ.

Family CAPRIMULGIDÆ.

Subfamily CAPRIMULGINÆ.

Antrostomus vociferus, Bonap.

This common and little known species arrives during the early part of May, already paired. It is of a shy and retired disposition, secluding itself during the daytime in close forests, among the leaves or underbrush, only venturing forth during the shadowy twilight in quest of its food, which consists of crepuscular and nocturnal lepidoptera and various species of Phyllophagous beetles. Such a partiality has it for the covert of woods that the writer has never startled it in the open fields. The dull and sombre shadows cast upon the ground by the fluttering leaves of the trees, with the faint streaks of light that come and go between their interstices, combined with the dark colors of the leaves that repose upon the soil, create a sort of gray light, which beautifully harmonizes with the natural tints of the bird. In my travels I have often observed a whip-poor-will to start up within fifteen paces of me, and after flying a short distance on swift and noiseless pinions, to alight upon the ground. After indicating the spot by a certain bush or fallen limb, I have stealthily approached, straining my vision to its utmost capacity to gain a glimpse of the squatting bird, but before I could gratify my desire, she was up and off again. Time after time has been so spent, but seldom has it been my fortune to witness the consummation of this desire. It has never been my lot to see the male and female together during the period of incubation. The merest apology of a nest is all that is constructed. By the side of a fallen and decayed log, usually on the side where the deepest shadow is found, the female has been observed to deposit her eggs. A slight concavity is scooped out by her, and frequently lined with decayed wood, reduced to a powdered condition, the site being selected where a ready supply of the material is at hand. There is never more than one brood in a season. The period of incubation ranges from fourteen to fifteen days. I have often been surprised while travelling to notice how conscious it is of approaching steps even when the greatest caution is observed to avoid giving alarm. Its visual organs being ill-adapted to the light of day, and even the mellowed light of the woods being too powerful a stimulus, it is certain that it must depend upon other means for the detection of danger. The organ of hearing, which is well developed, is assuredly called into requisition. This species makes its appearance rather late in the season, when the sun has obtained considerable power, and retires early, frequently as early as the 25th of September.

Family TROCHILIDÆ.

Subfamily TROCHILINÆ.

Trochilus colubris, Linn.

This beautiful little species, which is the only one of its family limited to this section of country (E. Penn.), makes its appearance during the early part of May, about the time the horse chestnut (*Æsculus hippocastanum*) spreads its rich clusters of fragrant blossoms to the vernal breezes. The small insects which frequent the blossoms for their honey, together with the honey itself, afford it a rich repast. It commences building during the early part of June, both birds working assiduously until the nest is completed. In the spring of 1872, Master Charles Silverthorn, one of the writer's pupils, secured for the latter's collection at least fifteen nests, from a district scarcely one-fourth of a mile in diameter, thus showing the abundance of the species in this latitude. Some of these nests were saddled upon the moss-covered branches of an apple or pear tree, while the major part of them was found upon the branches of various species of oaks, chiefly *Quercus rubra* and *Quercus alba.* They were constructed of a woolly substance of vegetable origin, plucked from the leaves of *Verbascum thapsus*, L., of almost immaculate whiteness. It is doubtful whether the soft down which appears upon the unexpanded leaves of the poplars is utilized, since the leaves are already developed in the generality of cases when nidification commences. The exterior of the nest is compactly covered by a thatching of bluish-colored lichens, possibly a *Parmelia*, glued thereon by a viscid saliva, secreted by the birds. I have never observed, as some, the small woody fibres on the outside, which are said to strengthen the fabric. Occasionally a few cobwebs have been noticed, but the manner in which the lichens cohere seems to be all that is necessary. The nests are usually 1.50 inch in diameter, with a depth of 1.75 inch. Specimens have been taken fully 2 inches in depth. The internal cavity never exceeds $\frac{3}{4}$ of an inch in depth, while instances are known of small nests with less than $\frac{1}{2}$ inch. The writer has taken nests during the latter part of July, with eggs, but whether a second set or not he is unable to say, possibly the work of pairs that have been frustrated in their labors during the early part of the season. During the hatching period the male is in close proximity to the nest, and if any attempt is made to interfere therewith, is foremost and loudest in his cries of resentment, and even flies into the intruder's face with half opened jaws, requiring considerable effort to beat him off. His mate is of a more passive nature. The period of incubation, according to the writer's estimate, is about eight days. So susceptible to cold is the species that I have known it to leave for the sunny south as early as the 10th of September.

Family CUCULIDÆ.

Subfamily Coccyzinæ.

Coccyzus Americanus.

This species, a very common resident during the warm season, arrives from the south during the latter part of April, and retires to its genial warmth early in the fall, frequently as early as the first of October. In this neighborhood the nest is usually constructed between the forked branches of *Maclura aurantiaca*, at an elevation of about ten feet from the ground. It is composed externally of small sticks and rude grasses, and lined internally with fine grasses. The male bird scarcely forsakes his mate during incubation, save to provide himself and her with food. When not thus engaged, he perches upon a limb of the same tree, within a short distance of the nest, ever watchful of her, and apparently ready to administer to her slightest calls. Feelings of the tenderest sympathy and the most devoted affection are mutually exhibited. It is not shy and timid in disposition, but shows confidence in man by building close to his domains. In the spring of 1872, from my school window I could command a view of a nest of this species, and observe the minutest details of its everyday life. My pupils frequently in their plays would pass underneath the tree, while the birds were engaged in building, but so intent were they upon their work that they heeded not their presence. The nest was completed, eggs were deposited and hatched, and the young matured; the parent birds evidently feeling as secure as in more sequestered situations. Such friendship as is here displayed should strike a sympathetic cord in the bosom of relentless man, and induce him to throw around such unsuspecting creatures the ægis of his protection. The period of incubation is fourteen days. When the female is with young, the duty of feeding devolves upon the male, who, with the instincts of a faithful husband and father, administers with alacrity to their physical wants.

Family PICIDÆ.

Melanerpes erythrocephalus, Sw.

This beautiful species is of rare occurrence in the vicinity of Philadelphia during the breeding season. It is more abundant, however, farther west. In the counties of Union and Northumberland, of the State of Pennsylvania, the writer has observed it in great numbers. There it is the principal species, as *Colaptes auratus*, Swainson, is in the east. It arrives seldom earlier than the first week in May, and soon begins to excavate a cavity in a tree for its nest. The place selected is ordinarily an apple tree close by the habitation of man, but occasionally a more secluded and retired spot. The writer has often observed the nests in the hollows of partially decayed willows upon the margins of ponds. The cavity ranges from ten to twelve inches in depth, being somewhat wider at the bottom than at the entrance; the latter being just wide enough to admit the body of the bird. Dr. Thompson, in his work entitled "Birds of Vermont," affirms that "the larger end of the egg is marked with reddish spots." This variety I have never observed. It may be an exceptional occurrence in more northern latitudes. From Samuels' description of the site selected for nidification, it would seem that this species is of a timid nature. Familiarity with its habits has convinced me that it is remarkably unsuspicious, and courts rather than shuns the society of man. In the month of August, not later than the 10th, in the central part of this State, the writer has seen immense flocks of this bird, numbering hundreds, within an apple orchard, tapping the rough and fissured bark of the trees in quest of the insects that lurk therein. So tame and confiding were they, that it was possible to approach within a few paces of them without exciting suspicion or creating alarm. In the vicinity of the White Deer Mountains, in the county of Union, they abound in immense numbers during the breeding season, and are the objects of protection by the farmers, for the good which they accomplish in the destruction of myriads of insects. The period of incubation ranges from fourteen to fifteen days. The usual complement of eggs is two, occasionally three have been found.

JULY 7.

The President, Dr. **RUSCHENBERGER**, in the chair.

Fifteen members present.

The death of Dr. Governeur Emerson was announced.

Prof. **PERSIFOR FRAZER**, Jr., made the following remarks:—

I had the honor, at the last meeting, of presenting to the Academy for its consideration, some attempts to reconcile the results of the analyses of minerals by the best chemists with formulas, which were constructed on the doctrine of quantivalence, *i. e.*, the known atom-saturating power of the elements. In my former communication I endeavored to show that such a mixture of definite chemical compounds (generally crystallizing in different systems) as was indicated by the greater number of the old formulas could not have those characteristic physical properties which serve to distinguish homogeneous bodies from each other; and above all, that no mixture of two minerals crystallizing in different systems could produce a third crystallizing in still another system. I stated that there seemed to be only two cases in which the formation of minerals in this way is possible; the one where one of the compounds preponderates to such an extent that the resulting mass is moulded according to its own morphological law; and the other where the resulting mass is not crystallized at all, but at most crystalline, *i. e.*, made up of minute crystals or individuals of each species, but simply aggregated together.

That such is the explanation of many crystalline and cryptocrystalline rocks the microscope has sufficiently demonstrated, and it would hardly be going too far to say, that, wherever an amorphous mineral shows such a chemical constitution that its elements cannot be brought into a single formula consistent with what we already know of the behavior of its anion and cathion radicals, a strong probability exists that the mineral is simply a mixture.

On this hypothesis of the case the circumstance cannot fail to demand explanation that the same mixtures in the same proportions should so often occur with similar paragenesis; and it is not to be denied that this fact needs careful study.

But in many instances the cause of this uniformity, itself apparently the result of chance, is to be traced to disintegration of a previously existing mineral into two or more others, or the partial alteration of one mineral into another throughout its whole mass, and by the action of outside forces.

Thus chalcopyrite might suffer partial decomposition into chalcocite and pyrite, or into tenorite and hematite, or into all four of these minerals, and while the mass could have no crystal form of its own, the mutual ratios of the resulting compounds would be more constant as the process of decomposition was more perfect.

It often results that in calculating a formula for a so-called species the results of analyses of specimens from widely distant localities, and made by different persons, agree remarkably well together, while the atomic ratio is such as to resist all efforts to bring these atoms into one homogeneous compound Often, too, the student sees clearly that he is dealing with a partially decomposed mass, and would, perhaps, be justified in writing "*a*, per cent. of the mineral A with *b*, per cent. of the mineral B disseminated through it," but it is obvious that he must assign wide limits to *a* and *b*; and if the species possess that patent of genuineness, crystal form, unless he define those limits his formula loses its value.

Take the case of smaltite. This mineral has very well-marked physical properties and unmistakable crystal form, and is an arsenate of cobalt, iron, and nickel, but its per cent. of As varies from 59 per cent. (Salvetal & Wertheim) to about 75 per cent. (Karsten); the Co from 0 per cent. (Rammelsberg) to 20 per cent. (Stromeyer); the Ni from 0 per cent. (Varrentrapp & Stromeyer) to 29.50 (Rammelsberg); the Fe from trace (Rammelsberg) to 18 (von Kobell); Cu from 0 per cent. (Lange, Booth, Karsten, &c.) to 2 per cent. (Jäckel). Besides these very large varieties of composition there are frequently found other elements with it, such as Bi and S. How is a formula to be constructed for such a mineral?

The only recourse is to the R's, and we have no less than four groups of formulas proposed by Dana, under one of which every smaltite yet analyzed can be brought. The first two of these are really identical, and differ only in the different proportions in which the analogous elements Ni, Co, and Fe, replace each other, and may be written RAs_2. But the next group (C) has the formula $RAs + RAs_2$, and the third (D) $RAs_2 + RAs_3$.

Independently of the presumptive evidence against such a mixture producing a beautiful octahedron of smaltite, where is to be the limit to such formulas? Why not $RAs + RAs_2 + RAs_3 +$ etc.? And would it not be well to adopt some more definite rule for assigning formulas to minerals of such variable composition?

Without naming these laws certain facts can be assumed on which to base them: 1st. If there is no single chemical formula which expresses the constitution of a crystallized mineral, then that mineral is a mixture. 2d. Its form is determined by the preponderance in quantity or in crystallizing power, or both, of *one* of its constituents. 3d. The mineral can only present its characteristics when the foreign ingredients are present under a given per cent.

The plan would seem to be to deduce from the known characteristics of the simpler compounds which most resemble it, to which of them it owed its morphological properties; and, having decided this question, to write the formula for that mineral as the species, and consider the other as a complex variety of it.

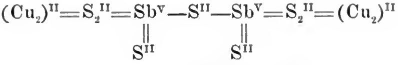
I append some few names of minerals with their old and new rational formulas generally compared, and in addition to the usual method of writing these new formulas I have added that form of graphic symbol which presents fewest typographical difficulties.

Old Formula.	New Formula.
Niccolite.	
$NiAs$ Ni_3As_3	$\left.\begin{array}{l} Ni^{II}=As^{I}-As^{I}=Ni^{II} \text{ or} \\ Ni^{IV}\equiv As^{V}-As^{V}\equiv Ni^{IV} \text{ or} \end{array}\right\}$ (?) $As^{III}\equiv Ni^{IV}-Ni^{IV}\equiv As^{III}$ $(Ni_2)^{VI}As_2^{III}$
Breithauptite.	
$NiSb$ Ni_3Sb_3	$(Ni_2)^{VI}Sb_2^{III}$
Bornite.	
$(Cu_2,Fe)S$	$(Cu_2)_3^{II}\equiv S_6^{II}\equiv(Fe_2)^{IV}$ $(Cu_2)_3^{II}Fe_2^{VI}S_6$ (Recalculated from one of the original records of analysis.)
Chalcopyrite.	
$Cu_2S+FeS+FeS_2$ (D) usually $Cu_2S+Fe_2S_3$	$(Cu_2)^{II}=S_2^{II}=Fe_2^{VI}\equiv S_2^{II}$ $(Cu_2)^{II}Fe_2^{VI}S_4$
Barnhardite.	
$2CuS+FeS+FeS_2$	$(Cu_2)_2^{II}\equiv S_4^{II}\equiv Fe_2^{VI}=S$ $(Cu_2)_2Fe_2S_5$
Calaverite.	
Au_2Te_4	$Te^{II}=Au^{III}-Te^{II}-Te^{II}-$ $-Au^{III}=Te^{II}$ $Au^{III}Te_2^{II}-Te_2^{II}Au^{III}$ $(Au^{III}Te_2^{II})_2$
Miargyrite.	
$Ag_2S+Sb_2S_3$	$Ag^{I}-S^{II}-Sb^{III}=S^{II}$ $Ag^{I}Sb^{III}S_2^{II}$

Old Formula. New Formula.

(Antimonial.) Tetrahedrite.

$4CuS+Sb_2S_3$

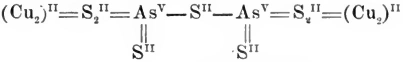


$$(Cu_2)^{II}{=}S_2^{II}{=}\underset{\underset{S^{II}}{\|}}{Sb^{V}}{-}S^{II}{-}\underset{\underset{S^{II}}{\|}}{Sb^{V}}{=}S_2^{II}{=}(Cu_2)^{II}$$

$(Cu_2)_2^{II}Sb_2S_7$

(Arsenical.) Tetrahedrite.

$4CuS+As_2S_3$



$$(Cu_2)^{II}{=}S_2^{II}{=}\underset{\underset{S^{II}}{\|}}{As^{V}}{-}S^{II}{-}\underset{\underset{S^{II}}{\|}}{As^{V}}{=}S_2^{II}{=}(Cu_2)^{II}$$

$(Cu_2)_2^{II}As_2S_7$

Wittichenite.

$3Cu_3S+Bi_3S_3$

$S^{II}{=}Bi^{III}{-}S^{II}{-}(Cu_2)_2^{II}\equiv$

$\equiv S_3^{II}\equiv Bi^{III}$

$(Cu_2)_2^{II}Bi_2^{III}S_5^{II}$

Note.—Dana gives the atomic ratio of Cu : Bi : S : : 3 : 1 : 3. From his seventh record of analysis (by Schneider), however, this ratio is 4 : 2 : 5.

Stromeyerite.

$(Ag,Cu_2)S$

$(Cu_2)^{II}{=}S_2^{II}{=}Ag_2^{I}$

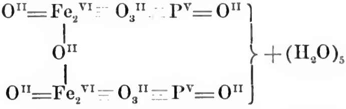
$((Cu_2)^{II}Ag_2^{I})S_2^{II}$

Note.—The atomic ratio expressed in Dana's formula is Ag : Cu : S : : 1 : 2 : 1, whereas from Stromeyer's analysis it appears very clearly as 1 : 1 : 1.

Dufrenite.

Karsten's Analysis D2.

$Fe_2O_3.PO_5+3HO$



$$\left.\begin{array}{l} O^{II}{=}Fe_2^{VI}\equiv O_3^{II}\equiv P^{V}{=}O^{II} \\ \quad\;\; | \\ \quad\;\; O^{II} \\ \quad\;\; | \\ O^{II}{=}Fe_2^{VI}\equiv O_3^{II}\equiv P^{V}{=}O^{II} \end{array}\right\}+(H_2O)_5$$

$(((Fe_2)_2^{VI}O_3)(P^{II}O_4^{II})_2^{III})_2+(H_2O)_5$

Libethenite.

$4CuO.PO_5+HO$

From the atomic ratio.

Cu : P : H : O : : 2 : 1 : 1 : 5

$Cu_2^{II}\equiv^{I}O_4\equiv P^{V}{-}O^{II}{-}H^{I}$

$(HCu_2^{II})(P^{V}O_5^{II})^{V}$

Olivenite.

$4CuO.(P,As)O_5+H_2O$

$((H^{I}Cu_2^{II})As^{V}O_5^{II})_2$

$Cu_2^{II}\equiv O_4\equiv As^{V}{-}O^{II}{-}H^{I}$

Note.—Some P replaces As.

	Old Formula.	New Formula.
Malachite.	$2CuO.CO_2$	$Cu_2^{II} \equiv O_4^{II} \equiv C^{IV} + aq$
Domeykite.	$(Cu_2)_3As_2$	$As^{III} \equiv (Cu_2)_3^{II} \equiv As^{III}$ $(Cu_2)_3^{II}As_2^{III}$
Dyscrasite.	Ag_2Sb	$Sb^{V} \equiv Ag_5$ Calculated from original record of analysis by Rammelsberg (No. 9 in Dana).
Leucopyrite.	$FeAs_2$	$As^{I} - Fe^{II} - As^{I}$ $Fe^{II}As_2^{I}$
Linnæite.	$2CoS + CoS_2$	$Co^{II} = S_2^{II} = Co^{IV} = S_2^{II} = Co^{II}$ $Co_3S_4^{II}$
Skutterudite.	$CoAs_3$	$As_3^{I} \equiv Co^{IV} - Co^{IV} \equiv As_3^{I}$ $(Co_2)^{VI}As_6^{I}$
Sylvanite.	$(Ag,Au)Te_3$	$Ag^{I}Te^{II} - Au^{III} = Te^{II}$ $(Ag^{I}Au^{III})Te_2^{II}$
Jamesonite.	$2(Pb,Fe)S + Sb_2S_3$	$Pb^{II} = S_2^{II} = Sb^{III} - S^{II} - Pb^{II} -$ $- S^{II} - Sb^{III} = S^{II}$ with Fe replacing Pb, or $Pb_2^{II}Sb_2^{III}S_5^{II}$
Chalcostibite.	$Cu_2S + Sb_2S_3$	$(Cu_2)^{II} = S_3^{II} = Sb_2^{III} \equiv S_2^{II}$ $(Cu_2)^{II}(Sb^{III}S_2^{II})_3^{I}$
Bournonite.	$3(Cu_2,Pb)S + Sb_2S_5$	$Sb^{III} \equiv S_3^{II} \equiv Pb_2^{II} - S^{II} - Sb^{III} =$ $= S_2^{II} = (Cu_2)^{II}$ $(Pb_2^{II}(Cu_2)^{II})(Sb^{III}S_3^{II})_2^{III}$

Old Formula.	New Formula.
Stephanite.	
$5AgS + Sb_2S_3$	$Ag_5^{I} \equiv S_5^{II} \equiv Sb^{V}$ $Ag_5^{I}Sb^{V}S_5^{II}$

Note—Dana's first record of analysis by H. Rose gives atomic ratio of Sb : S : Ag : : 1 : 4.2 : 5.2, but the indications are of a compound as above.

Old Formula.	New Formula.
Sartorite.	
$PbS + Sb_2S_3$	$Pb^{II} = S_2^{II} = Sb_2^{III} \equiv S_2^{II}$ $Pb^{II}(Sb^{III}S_2^{II})_2$
Brochantite. From Forchhammer's Analysis (D 3).	
$(3CuO.SO_3)_2 + CuO.HO$	The ratio of Cu : O : S : H : : 3 : 9 : 1 : 6 hence $Cu_2^{II} \equiv O_4^{II} \equiv S^{VI} = O_2^{II} = Cu^{II} +$ $+ aq$ hence $Cu_3^{II}S^{VI}O_6^{II} + (H_2O)_3$

Change of Habit in Smilacina bifolia.—Mr. Thomas Meehan remarked that this plant, as was well known, was usually terrestrial, preferring generally the vicinity of large trees. It propagates itself by underground stolons, advancing but a few inches each season; the stolons of the preceding year dying as soon as a new one was made. He had recently seen a case where the stolons had advanced from the ground, and up the trunk of a large chestnut tree, to the height of about two feet; the original stolons for several years back having died away, and the plant taken in a purely epiphytal character. The roots and stolons mostly had penetrated the coarse, rough bark of the chestnut tree, the leaves only being chiefly visible. The fact is trifling, and in old times, perhaps, hardly worth recording; but in these days, when the change of character in connection with the evolution of form had such a general interest, even this was worth recording.

July 14.

The President, Dr. Ruschenberger, in the chair.

Seven members present.

The following papers were presented for publication:—

"On Fertilization of certain Flowers through Insect Agency, and other Matters Botanical." By Thos. G. Gentry.

"Description of a new species of Helix." By Jas. Lewis, M.D.

"On some Batrachia and Nematognathi brought from the Upper Amazon by Prof. Orton." By Edw. D. Cope.

The resignation of Mr. N. E. Macomber as a member of the Academy was offered and accepted.

Prof. Cope stated that the snakes of the genus *Storeria*, B. and G., are viviparous like *Eutænia* and other tropidonotine genera to which they are allied. He had frequently made this observation, but had not placed it on record so far as he knew. He also stated that the Colorado potato beetle had probably terminated in its eastern migration, as it had appeared pretty well distributed in New Jersey the present season.

Prof. Cope gave a synopsis of the result of his work in connection with Hayden's United States Geological Survey of the Territories during the season of 1873. He stated that the investigation covered principally the paleontology of the cretaceous, eocene, miocene, and pliocene periods in Colorado. The whole number of species of vertebrata obtained was one hundred and fifty, of which ninety-five were at the time new to science. The cretaceous species were both terrestrial and marine, and the miocene were most numerous. These numbered seventy-five species, of which fifty-seven were new. They embraced, as especial additions to the fauna, numerous reptiles and *Mammalia* of all the orders, especially *Insectivora*, *Rodentia*, and *Carnivora*. Important additions were the gigantic horned *Symborodons*, and numerous very small ruminants allied to the *Tragulidæ*. He stated that the discovery of the latter added a stronger resemblance to the miocene of France than had been heretofore supposed to exist. The existence of *Elotherium* and *Anchitherium* gave the fauna somewhat older facies than that of France.

He stated that the only genus of lizards that could be well analyzed is the *Peltosaurus*, Cope, and that this proves to be a member of the existing family of *Gerrhonotidæ*, which is now confined to Mexico and California. Hence, like many rodents, but unlike the higher mammalia, these miocene lizards had continued with but little modification to the present day.

He also discussed the age of the Bridger eocene, stating that it had been originally termed miocene by the geologists of King's survey, and later lower miocene, or upper eocene, by Marsh. He had published it as eocene in 1872, and contended that it presented features which indicate a somewhat earlier age than that of the Paris basin. He said that there were numerous parallels of corresponding genera in the two; the *Mesonyx*, *Palæosyops*, *Hyrachyus*, *Achænodon*, *Hyopsodus*, and *Anaptomorphus*, of the Bridger formation, represented the *Hyænodon*, *Palæotherium*, *Lophiodon*, *Anthracotherium*, *Hyracotherium*, and *Adapis* of the Paris basin respectively. The former was, however, entirely peculiar in its *Eobasiliidæ*, *Bathmodontidæ*, and *Anchippodontidæ*, and in its almost entire want of artiodactyles (none with crescent-bearing teeth), while the French eocene possessed non-ruminating artiodactyles, with crescent-bearing teeth, in its numerous *Anoplotheriidæ* and *Hyopotamidæ*. He concluded that there were good reasons for regarding the facies as older than that of the Paris basin.

JULY 21.

The President, Dr. RUSCHENBERGER, in the chair.

Nine members present.

Prof. PERSIFOR FRAZER, JR., made the following remarks: The coal-cutting machine, designed by Mr. Jas. Brown, of Brazil, Ind., and photographs of which were kindly sent me by the inventor, and are herewith offered for the inspection of the members, consists of a steel or iron wheel set in a frame, connected with the pneumatic engine, which runs in rails laid parallel to the face of the heading, which in this case may be several hundred yards long.

On the outer periphery of this wheel are arranged twenty or thirty triangular-shaped pieces of steel, united with it at one of their apices by a pin. In the middle of the opposite side, which is curved, are firmly fixed chilled-steel teeth, which set themselves by friction against the coal to the proper position for cutting, as the wheel is rotated to the right or left. The motion is imparted by means of a small-toothed wheel which moves in rackwork on the under surface of the wheel.

The machine is suitable for the soft coals of jointed structure (*i. e.*, the black coals), and is operated by causing the machine to revolve against the face of an exposure, and at the same time draw itself forward, by means of a rack and pinion attachment, to a middle rail. When it has undercut the coal as far as it can, it is caused to move sideways along the pair of rails first mentioned until it has cut a channel an inch or two high, four and a half feet deep, and as long as the breadth of the heading. The blocks of coal are thus separated from the rest, except on two sides, viz., the upper and the rear sides, and a skilful miner can knock down with the pick huge cubical blocks, which are comparatively regular, and suffer less loss by attrition in transportation.

As in all pneumatic machines the escaped air aids materially in ventilating the mine.

JULY 28.

The President, Dr. RUSCHENBERGER, in the chair.

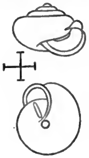
Six members present.

On report of the committees to which they had been referred, the following papers were ordered to be published:—

DESCRIPTION OF A NEW SPECIES OF HELIX.

BY JAMES LEWIS, M.D.

Helix (Mesodon) Lawii, Lewis.



Shell umbilicated, subglobose; epidermis pale corneous, thin and delicately striate; spire but a little elevated; suture quite distinctly impressed; whorls nearly five, the last a little expanded and then conspicuously contracted as it approaches the peristome; peristome white, reflected, rather narrow, scarcely thickened, the margin being somewhat sharp; aperture well rounded, elliptically lunate, scarcely less in area than the unexpanded portion of the last whorl, and scarcely modified by the presence of a narrow, slightly curved, slightly elevated lamellar tooth on the parietal wall; umbilical region but a little impressed; umbilicus narrow, deep and scarcely contracted by the proximity of the reflected lips; base somewhat convex. Greater diameter 5.9, lesser 5.3, alt. 3.6 mm. A smaller specimen—greater diameter 5.6, lesser 4.9, alt. 3.5 mm. Found among roots of strawberry plants in fields near Hayesville, Clay Co., N. C. Miss Annie E. Law.

Cabinet of Isaac Lea, LL.D., Philadelphia.

Cabinet of the Academy of Natural Sciences, Philadelphia.

Remarks. Under the present system of classification the above described shell will, no doubt, be regarded as coming within the limits of the subgenus *Mesodon*. Possibly a revision of subgenera might with propriety be made to set this species apart.

The shell is about of the size and form of *helicina* (*Ologyra*) *orbiculata*, Say, but will at once be distinguished by its somewhat translucent aspect, its umbilicus, and the noticeable lamelliform tooth on the parietal wall. Regarded as belonging in the subgenus *Mesodon*, it will at once be recognized as the most diminutive known member of the group. It is not without importance, inasmuch as it increases the list of rare species referable to *Mesodon* heretofore found in Cherokee Co.,[1] N. C., a portion of which territory forms what is now known as Clay County. The shell can scarcely be confounded with any known species. At the request of Mr. Lea (who refers the shell to me for description) I name the species in honor of Miss Annie E. Law, whose earnest labors in this department of zoology merit a much higher recognition than this.

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[1] Helix Clarkii, Lea, Helix Wheatleyi, Bland, Helix Christyi, Bland.

ON SOME BATRACHIA AND NEMATOGNATHI BROUGHT FROM THE UPPER AMAZON BY PROF. ORTON.

BY EDWARD D. COPE.

BATRACHIA.

URODELA.

Oedipus altamazonicus, sp. nov.

Represented by three specimens. These are of slender form with long tail and weak limbs. The digits are palmate to the tips. The head is an elongate oval, and its width enters the length to the groin more than six times. The end of the muzzle is tumid, and notched in the middle; the external nostril pierces each tumidity above the lip. The vomerine teeth are in two short arches meeting in the middle and not extending outwards beyond the inner margin of the inner nares. Parasphenoids numerous, the patches not distinguished anteriorly. Thirteen costal folds, the oppressed foot and thin limbs each extending over four of them. Tail swollen at the base, a vertical oval in section. A groove along the median line of the back and tail. Dermal pores numerous. Color uniform dark brown.

Total length of a small specimen .082 m.; of head and body, .040; of head, .007; width of head behind, .005; length of foot limb, .007. Length of head and body of a larger specimen, .050.

This is the most southern known salamander, the first discovered south of the equator.

From Nauta.

ANURA.

Bufoniformia.

Bufo agua, Dand.

Bufo naricus, Spix.

Bufo margaritifer, Laur. *Otilophus* Cur.

Bufo granulosus, Spix.

From the Marañon.

Arcifera.

Phyllomedusa scleroderma, Cope. Proceed. Acad. Nat. Sci., Phila., 1868, p. 112.

From Nauta.

Pithecopus tarsius, Cope, loc. cit., p. 113.

Nauta.

Pithecopus cœlestis, sp. nov.

General appearance and size much as in *Phyllomedusa bicolor*, but there is no trace of parotid gland or line of crypts. The pigment of the upper surfaces extends on the humerus and the outer two toes of both limbs. Vomerine teeth present. Palpebræ not reticulate; no dermal processes. Tympanum a vertical oval .3 to .25 of the diameter of the eye. Muzzle short, obliquely truncate to lip. It is reached by the elbow of the extended fore limb; the heel only reaches the front of the orbit. First finger opposable; first toe longer than second; third with very small dilatation. Superior surfaces blue, sides yellow, with vertical purple bars. Concealed surfaces light maroon, with yellow spots; on the posterior face of the femur in two series. Belly and throat sea-green, unspotted. Lower lip yellow bordered; upper lip without markings. Upper eyelids yellow bordered.

Skin smooth above, sides coarsely, belly finely areolate. Forearm and outer toe with a narrow yellow line on the outer margin. A similar one above vent. Length of head and body, .057; of head to angle of jaws, .016; width of head at angle of jaws, .020; length of fore limb, .040; of hind limb, .080; of hind foot, .036; of tarsus, .020.

From Moyabamba, Peru.

Pithecopus tomopternus, Cope, loc. cit., p. 112.

Abundant at Nauta.

Hypsiboas punctatus, Daudin, Dum. Bibr., viii. 552.

Nauta.

Hypsiboas crepitans, Wied. Beitr. Naturg. Braz., i. 525.

From Nauta.

Hypsiboas spectrum, Reinhot. et Lütk. Viden. Medd. Nat. Forening Kjobenhavn, 1861, p. 195.

Very nearly allied to, if not identical with this species. From Nauta.

Centrotelma geographicum, Spix, Cope, Journ Acad., Phila., 1867, 205.

From Nauta.

Hyla marmorata, Daudin, Cope, Proceed. Academy, Phila., 1868, p. 111.

Nauta.

Hyla leucophyllata, Beireis; vars. *typica* et *triangulum*, Gthr.

Nauta.

Osteocephalus planiceps, sp. nov.

A rather slender species, with long limbs, and the general proportions of the species of *Hypsiboas*. Head broad and plane on the upper surface to the straight and rectangular canthus rostralis. Loreal region nearly vertical. The fronto-parietal bones are ossified, and the nasals meet on the middle line; their superior surface is rugose with ossific deposit, which in some cases assumes the form of radiating ridges, but nowhere penetrates the free derm. The lateral margins of the fronto-parietals are indicated by delicate angular ridges incurred posteriorly. The vomerine teeth form two curved transverse series between the posterior portions of the inner nares, the angle forwards the outer limb a little longer. Choanæ very large, *ostia pharyngea* half the size. Tongue oval, bound behind. Eye large with transparent palpebra, its diameter equal to the space between it and the nostril, one-fourth greater than that of the large membranum tympani, and one-fourth less than the frontal width. Belly and sides coarsely areolate, back minutely tubercular. A short tubercular fold from orbit to behind scapula. Fingers free; toes webbed to the base of the penultimate phalange of the fourth digit; first (least) toe webbed to disk. The heel of the extended hind limb extends beyond the muzzle by the diameter of the tympanum. No dermal fringes or processes.

Color above uniform dark brown, concealed surfaces of limbs similar and without any markings. Sides a little varied with the white of the belt. A light border to the upper lip, and lighter line from the orbit to the angle of the mouth; dermal scapular fold pale edged. Femur and tibia with dark crossbands on the exposed surfaces.

	M.
Length of head and body	.060
" " (axial) to angle of mandible	.017
Width " at " "	.019
Length of muzzle from orbit	.009
" of fore limb	.037
" of hand	.016
" of hind limb	.093
" of foot	.037
" of tarsus	.019

This is the fourth species of the genus *Osteocephalus*, Fitz, and differs from those previously known in the absence of palmation of the fingers, weaker cranial crests, straight canthus rostralis, etc.

From Nauta.

Scytopis funereus, sp. nov.

Vomerine teeth in short fascienti between the choanæ. Fingers free. Head oval, muzzle narrowed; eyes small, diameter equal length to muzzle and less than frontal width, twice diameter of tympanic membrane. Hind limbs long, the heel extending to considerably beyond the end of the muzzle. First (inner) toe nearly free; longest webbed to base of penultimate phalange. Areolation of belly fine, back with a very few scattered elevations. Dark brown or blackish with a broad black cross-band between the eyes and several across arm, femur, tibia, and tarsus. Femora uniform behind; a few black spots on the posterior part of the side. Throat and breast black punctated.

	M.
Length of head to angle of lower jaw	.012
" of head at angle of lower jaw	.015
" to vent	.044
Width of sacrum	.008
Length of hind leg	.073
" " foot	.030
" " tarsus	.013

Distinguished from other species of the genus by its long legs.

From Moyabamba, Peru.

Scytopis allenii, Cope, Proceed. Amer. Philos. Soc. 1869, p. 162.

From Nauta and Moyabamba.

Scytopis cryptanthus, sp. nov.

Allied to the last species, but with non-elongate flat head, and different coloration. The head is a long oval, and the diameter of the eye is only three-fifths the length from its border to the external nostril, about .75 the interorbital width, and one and one-half times that of the membranum tympani. Vomerine teeth between nares. The heel of the extended hind limb marks the half the distance from orbit to end of muzzle. Fingers and first toe free. Uniform dark brown above, sides and gular region brown speckled. Groin and concealed surfaces of hind limbs black, with brillant yellow spots, three on the under side of the tibia, two on the posterior face of the femur, and one large confluent one on the front of femur and groin, which is on the former notched above by two or three black spots.

	M.
Length of head and body	.044
" of head to angle of jaws	.015
Width " above angle of jaws	.015
Length of hind limb	.070
" " foot	.030
" " tarsus	.012

From Nauta.

The species of this genus may be divided as follows:

Fingers webbed.	*S. venulosus.*
Fingers free.	*S. aurantiacus.*
Heel extending to beyond muzzle.	*S. funereus.*
Heel not reaching end of muzzle.	
Skin smooth above.	*S. allenii.*
	S. xsignatus.
	S. cryptanthus.
Skin arrolate above.	*S. ruber.*
	S. acuminatus.

Scytopis amantiacus, Daudin.

Nauta.

Nototrema marsupiatum, Derm. Bibr. Evp. Gen. viii. 598.

Nauta; in two specimens, the ethmoid is unossified above, while there is no fronto-parietal fontanelle.

Family CYSTIGNATHIDÆ.

Subfamily CYSTIGNATHI.

Bubonias plicifrons, gen. et sp. nov.

Fronto-parietal bones fully ossified, nasals separated. Xiphisternum, an osseous style with disk. Auditory organs well developed. A large gland in the inguinal region; no tarsal shovels nor spurs. Maxillary, but no vomerine teeth. Form, toad-like.

This genus it is evident presents characters of *Liuperus* in dentition, *Pleurodema* in glands and feet, and *Cystignathus* in cranial structure.

Char. Specif.—Head narrow, with elevated lores. Membranum tympani oval, its long axis directed upwards and forwards, and nearly equal in length to that of the eye. The latter equals the length from its border to the end of the (osseous) muzzle. Skin everywhere smooth except in the following regions of the upper surface. A strong elevated fold from the superciliary border to the inguinal gland, below which on the scapular region is a boss like a parotid gland: A fold from the inner border of the eyelid to the end of the sacral diapophysis; a fold from the end of the muzzle to the end of the coccyx on the median line. A short conic tubercle stands at its extremity on the muzzle. Edge of the eyebrow with three dermal processes or "horns." There is a ridge extending along the inner border of the large choanæ which supports no teeth. Tongue a long oval, notched posteriorly. The middle of the forearm marks the end of the muzzle, and the heel, the tympanum. Digits all entirely free.

Color above brown; below pure white; sides pure black, the color extending on the sides of the abdomen and then passing round in front of the femora, thus inclosing an anchor-shaped space of white. A black spot on the posterior part of the inguinal gland; femora behind with a black band from one popliteal region to the other. From this, black bands extend to the end of the coccyx, one across the femur above, and a broad one across the femur below, near the knee. Tibia below black, with a yellow cross-band. Limbs above brown; forelegs black and white spotted below.

	M.
Length of head and body	.038
" " to angles of mandible	.012
Width " at " "	.012
Length of fore limb	.021
" of hind limb	.045
" of hind foot	.022
" of tarsus	.008

Two specimens from Nauta.

The dermal plicæ though strong are easily lost by stretching.

Cyclorhamphus æmaricus, sp. nov.

Form like *Scaphiopus*. The tympanic membrane wanting and the tympanic chamber occupied by muscle. Ostia pharyngea minute; their depth not ascertained. Vomerine fasciculi minute, and between the small choanæ. Tongue round, extensively free. Labial integument largely free and overhanging the lower jaw. Xiphisternum broad, emarginate base osseous. Limbs short, the heel reaches about to the angle of the mouth. Fingers free, toes half palmate; a free border on the inner side of the tarsus, and outer side of outer toe. Skin smooth except a few small tubercles on the occipital region. In the male there are numerous small horny points on the breast, and a large horny plate on each thumb, whose surface is roughened with crowded projecting points.

Color olive-brown above, lighter brown below; one specimen has a few scattered yellow spots above.

	M.
Length of head and body	.048
" of head to angle of mandible	.012
Width " at " "	.018
" " interorbital	.004
Length of fore limb	.025
" of hind limb	.068
" of hind foot	.032
" of tarsus	.012

Two specimens from lake Titicaca.

This species has a much less depressed head than the *C. marmoratus*, and probably a less developed auditory apparatus, and vomerine tooth series. The coloration is entirely different. The *C. fasciatus*, Peters, is equally distinct, judging from the description.

Hylodes sulcatus, sp. nov.

Distinguished for its very wide head and rugose skin. The form is stout, but the hind limbs rather elongate. The maxillary borders are so expanded as to give the tympanic disks a partly vertical exposure. These are vertically oval, the diameter a little less than that of the orbit. The latter is a little less than the length to the anterior nares. Choanæ large, but little larger than the ostia pharyngea. Vomerine teeth in two short curved series entirely behind the choanæ, and not extending outwards beyond their middle; they approach nearly inwards. Tongue round, entire, one-third free. Fingers very short without expansions. Heel of extended hind limb to nares; expansions of hind toes well marked, with T-shaped phalanges. A peculiarity of the species is seen in the strong ridge that extends along the superciliary border to the posterior border of the cranium, inclosing a groove with its fellow. Skin below areolate on the belly; above with numerous short, generally symmetrical folds, two of which cross the suprascapular region, two on the sides, two on each side the back, etc. The sides of the head from the orbit to the angle of the jaws is covered with closely placed tubercles giving a rugose surface.

Color, deep brown above, white below. Limbs crossbarred with brown; femora pale, marbled behind. Lips without light border; a pale spot below the interval between orbit and tympanum.

	M.
Length of head and body	.047
" of head to angle of jaws	.016
Width of head at angle of jaws	.025
" of head at interorbital	.004
Length of fore limb	.024
" of hind limb	.075
" of foot	.034
" of tarsus	.014

From Nauta. Evidently allied to the *Strabomantis biporcatus*, Peters.

Lithodytes conspicillatus, Gthr. Batrach, Brit. Mus, 92, Var.

"Santarem, Brazil, No. 141."

Plectomantis rhodostima, sp. nov.

General form ranoid, with oval head and full and truncate muzzle. The head of the extended hind limb reaches to the posterior border of the orbit. Tympanum .66 the size of the eye, which equals in terorbital width and length to nostril. Vomerine teeth, in two short curved series, on a transverse line behind the nares, and extending upwards as far as their inner border. Their size a little exceeds that of the ostia pharyngea. Tongue elongate oval, largely free. Skin smooth above and below. Toes before and behind, with well-marked dilatations, and without dermal margins. Color, above uniform brown, below whitish; muzzle blackish to the orbits; femora dark-brown behind. A rose-colored spot in the groin, one on the superior face of the femur, two on the inferior face of the tibia, and one on the superior face of the tarsus.

	M.
Length of head and body	.045
" of head to angle of jaws	.014
Width of head at angle of jaws	.015
" of head between orbits	.004
Length of fore limb	.026
" of hind limb	.059
" of hind foot	.029
" of tarsus	.012

One specimen from Nauta.

This species has the cranial structure and xiphisternal style of *Cystignathus*, but the T-shaped phalanges and disks of *Hylodes*. The *Plectromantis wagneri*, Peters, I have examined in Munich, and find it to be closely allied to *Cystignathus*, so far as external appearances are concerned, but further than this I could not examine. It, however, has digital dilatations, and I refer the present species, provisionally, to the same genus, suspecting that such course will be warranted by a fuller investigation of the type specimen. As here defined, it bears the same relation to *Cystignathus* that *Hylorana* does to *Rana*.

Cystignathus hallowellii, Cope, Proceed. Academy, Philada., 1868, 115. *Hylodes hallowellii*, Cope, l. c., 1862, p. 153.

A variety from between Balso Puerto and Moyabamba, Peru.

Gnathophysa ocellata, Linne; Seba, pl. 75, fig. 1. *Cystignathus labyrinthicus*, Dum. Bibr. Castelnan. *Pleurodema labyrinthica*, Gthr.

From Nauta.

Gnathophysa rubido, sp. nov.

A much smaller species than the preceding, represented by two males and a female, the former with the nuptial spurs largely developed. The metacarpus of the pollex terminates in one, and the second projects from the metacarpus of the second digit. There is one with three mucrones on each side of the breast. The general form is stout. The toes are without free dermal margins, and the smooth abdominal derm has the discoidal fold. The vomerine teeth form two short transverse open arches behind the nares, not extending outwards beyond, opposite the centres of the latter. There is a dorsolateral fold from the orbit to near the groin, and another, commencing just below it, extends to the middle of the side, and sends a short branch down behind the membranum tympani. Dorsal surface smooth, pustular between the ilia; tibia pustular above. The head is a wide oval, with a short decurved muzzle, and large eyes. The diameter of the latter exceeds the length to the outer nares, and is nearly twice that of the tympanic membrane. Tongue elongate oval, faintly notched, choanæ and ostia near the same size. The heel of the extended hind limb falls short of the orbit. The lateral glandular mass extends from near the axilla to the groin and occupies the width of the side.

Color, above reddish to brown, in one specimen bright-red; femora black behind, faintly pale-marbled; front of femur black, a few black spots in the groin. Entire hind limb black, cross-barred. A narrow black bar from nostril to tympanum; upper lip broadly black-bordered. Inferior surfaces dark-brown, with numerous pale dots, which may be wanting on the gular region, and inosculate on the femur.

	M.
Length of head and body	.066
" of head to angle of jaws	.019
Width of head at angle of jaws	.026
" of head between orbits	.006
Length of fore limb	.035
" of hind limb	.081
" of hind foot	.040
" of tarsus	.016

From Moyabamba, Peru.

Dendrobates trivittatus, Spix (?).

This species agrees with the figure given by Spix, and differs from the description by Günther, of the *D. tinctorius*, to which the latter author refers it as a synonym. Thus the dorsal derm is closely areolate, and the ventral smooth, and the first finger is longer than the second. There are three longitudinal yellow bands, the outer springing from the orbits, the median from between them. The lateral extend to the knee, while another band extends from the lips below the orbit to the middle of the humerus. A yellow horse-shoe on the end of the muzzle; below black, with yellow spots on the limbs only. Femur with few spots behind.

From between Balso Puerto and Moyabamba, Peru.

Dendrobates labialis, sp. nov.

Skin minutely areolate on the upper surfaces, smooth below. Muzzle flat, moderately elongate, and broadly truncate. Tympanum one-fifth size of eye, which equals length of muzzle and interorbital width. The muzzle marks the end of the forearm, and the posterior edge of the orbit the heel. First finger longer than the second. The upper surfaces are colored by some pigment, whose distinctive character has been lost in the alcohol. Upper lip pale banded, the band extending through the axilla, and meeting its fellow at the pubis. No spots or bands on the upper surfaces.

	M.
Length of head and body	.026
" of head to angles of jaws	.010
Width of head at angle of jaws	.008
Length of fore limb	.015
" of hind limb	.035
of hind foot	.017

From Nauta.

Dendrobates speciosus, Schmidt, Denkschr. Acad. Wiss. Wien, 1858, p. 249.

From

Atelopus seminiferus, sp. nov.

Body elongate, limbs rather short; the muzzle nearly reaching the middle of the extended forearm, and the heel marking the scapula. The muzzle viewed from above is rounded, truncate, and in profile somewhat prominent; the nostril marking a line which falls behind the symphysis of the mandible. The eyelid is thickened, and is not prominent; and the diameter of the eye equals the length of the muzzle and the posterior interorbital width. The ethmoid appears to be ossified to the end of the muzzle. Fingers slightly, toes largely webbed, the web reaching the end of the first phalange of the fourth (long) toe. Tongue narrow, extensively free; ostia pharyngea smaller than the small choanæ. Skin smooth except on the sides, where there are numerous closely-placed minute tubercles from the head to the groin. A broad fold of skin extending from the side to the middle of the length of the femur.

Above, dark-brown; below, brownish-orange. Sides black from head to groin; each tubercle of the skin yellow, resembling yellow grains. Limbs uniform black.

	M.
Length of head and body	.040
" of head to angle of jaws	.009
Width of head at angle of jaws	.009
Length of fore limbs	.026
" of hind limbs	.045
" of hind foot	.021
" of tarsus	.007

From between Balsa Puerto and Moyabamba, Peru.

This species has a much shorter muzzle and limbs than the *A. spumarius* (Proceed. Acad. Philada., 1871, p. 222); from Pebas.

Colostethus latinosus, Cope (?), Proceed. Academy, Philada., 1866, 130, and 1863, 48. Colors not presented; identification not final.

Between Balsa Puerto and Moyabamba.

RANIFORMIA.

Ranula brevipalmata, sp. nov.

Nearly allied to the *R. affinis*, but with the web of the posterior digits only reaching the bases of the ultimate, or in the fourth toe, the penultimate phalange. The membranum tympani is as large as the eye (not orbit); and the nostril is near the end of the muzzle. The extended hind limb brings the heel to the anterior border of the orbit, instead of the end of the muzzle, as in *R. affinis*. General color, olive; below, white. Femora and tibiæ marbled, with black behind.

	M.
Length of head and body	.049
" of head to angle of jaws	.020
Width of head at angle of jaws	.019
" of head between orbits	.005
Length of fore limb	.027
" of hind limb	.074
" of hind foot	.034
" of tarsus	.012

From Nauta.

Ranula nigrilatus, sp. nov.

Toes fully palmate to ends of last phalanges, or base of same on the fourth digit. Heel of extended hind limb reaching anterior border of orbit. Eye one and a half times the diameter of the tympanum, and equal to the length of the lores to the nostril. Muzzle truncate in marking the middle of the metacarpi of profile; flat above the extended fore limb. First and second fingers equal; a tarsal dermal fold. Skin smooth.

Color, dark-brown; sides black; lower surfaces closely marbled with dark-brown. Femora and tibiæ black, marbled behind.

	M.
Length of head and body	.048
" of head to angle of jaws	.018
Width of head to angle of jaws	.018
Length of fore limb	.025
" of hind limb	.070
" of hind foot	.034
" of tarsus	.012

This species has the palmation of *R. affinis*, and the short legs of *R. brevipalmata;* the tympanum is smaller than in either. The head is longer and the femur shorter than in the latter. The coloration is notably distinct. In neither of these species do I find the dorsolateral dermal fold of the *R. affinis*, though this may be due to the rather soft state of the specimens.

From Nauta.

NEMATOGNATHI.

Trichomycterus pardus, sp. nov.

Origin of dorsal fin but little behind a point above that of the ventrals. Radii, D. 8; A. 6; V. 5; A. 12; truncate. Head flat, entering the length without caudal fin 4.8 times. Diameter of orbit one-sixth length of head, and one-half interorbital breadth. Nareal beard extending backwards beyond eye, and the maxillary to the border of the suboperculum. Preopercular and opercular patches full. Color above yellowish-brown, with three rows of dark-brown spots on the sides. Fins and lower surfaces pale and unspotted. Total length, .073; caudal fin, .011; head, .010; depth at dorsal fin, .011.

This is one of the few species of the genus where the dorsal fin is nearly immediately above the ventrals.

From

Trichomycterus rivulatus, Cud., vol. xviii. 495.

From Arequipa, Peru.

Bunocephalus melas, sp. nov.

Radial formula: D. 5; P. I. 5; V. 6; A. 7; C. 10. Head and shield are elongate oval, without prominent ridges or marginal angles. The anterior humeral tuberosity marks one-third the length to the middle of the shield at the basis of the dorsal ray. The width in front of the pectoral spine is a little less than .25 of the total length (including caudal fin); the length of the post-coracoid process is equal to nearly two-thirds of the interspace between them. The maxillary barbel extends to the end of the basal third of the pectoral spine; the latter oppressed, reaches the base of the ventral fins. Tail at anal fin wider than deep; compressed near the base of the caudal fin. Four rows of wartlets on the sides, one of them on the lateral angle of the tail. Dorsal fin nearer the end of the muzzle than the base of the caudal fin by two-thirds the length of its base.

Color black, darkest on the sides; head speckled with paler. Total length .072; to caudal fin, .059; to dorsal fin, .028; to dorsal shield, .025; to line of anterior humeral tuberosity, .008; to orbit, .003.

From Nauta. The dorsal fin is apparently more posterior than in *B. gronovii*, and there are fewer anal rays than in *B. aleuropsis*.

Dysichthys coracoideus, gen. et sp. nov.

Char. Gen.—In general similar to *Bunocephalus*, but there are no mandibular nor mental barbels. The head is depressed, but deeper than the narrow tail.

Char. Specif.—Radial formula, D. 5; A. 7; C. 10; V. 6; P. I. 4. Dorsal fin bound to the back behind by its membrane, the base of its first ray a little nearer the end of the muzzle than the basis of the caudal fin. The head and neck shield is diamond-shaped, with truncate angles, and the humeral angles mark the middle of its length instead of an anterior point, as in *Bunocephalus nelas.* The anterior humeral tuberosity marks one-third the length from the end of the muzzle to the second dorsal ray, measured axially. The shield is peculiar for its strong ridges and scalloped borders. A high heel, with three prominences, divides it behind, while the scutum supports another. The posterior border presents two angles, and there is a ridge across behind the orbits. A ridge from each orbit meets its fellow, forming a V at the occiput, and a ridge from the humeral process meets its fellow behind this point. The postcoracoids are longer than in *B. melas*, their length equalling the width between them. The pectoral spines extend beyond the base of the dentrals. The maxillary barbels extend to the base of the pectoral spines. The tail is quadrangular with a line of evantlets along the lateral angle. Belly, tail, and fins, black; throat and belly white speckled. Shield brown, with some paler specks. Total length, .055; do. to caudal fin, .046; do. to dorsal, .021; do. to dorsal scutum, .018; do. to humeral tuberosity, .010; do. to orbit, .003.

Several specimens from Nauta.

Zathorax nauticus, sp. nov.

Coracoid portion of the scapular arch only ossified so as to occupy the derm. Postcoracoid narrow, not excavated. A distinct adipose fin. Prefrontal bone acutely pectinate on its upper face. Head (to end of casque) one-third length to middle of caudal fin. Orbit one-third length of head (to gill opening), and nearly equal interorbital width. Mandibular barbel to end of postcoracoid process; maxillary to end of pectoral spine. Width of casque greater than the interorbital. Radii D. L. 6; A. 12; V. 7; P. I. 4. Dorsal spine grooved, not dentate; pectoral spine strongly toothed extending beyond basis of ventral fin. Postclavicle with recurved teeth; caudal fin truncate. Lateral shields 26 low, leaving a broad naked band above and below them; with a single strong median curved spine. Color brown above, with a yellow band along the middle of the side border red with black above and below. Belly white; below the pectoral fin purple. Caudal fin with some vertical dark bars. Total length, .082; do. to first anal ray, .045; do. to end of postcoracoid, .026; do. to base of dorsal fin, .026; do. to gill opening, .016; do. to orbit, .004.

From Nauta. The less exposure of the scapular arch below, simple postcoracoid, etc., distinguish this fish from the *Z. monitor*, m. According to the description of Dr. Günther the *Doras asterifrons* pertains to the genus *Zathorax*.

Rhinodoras niger, Valenciennes; Gthv. v. 209.

Nauta.

One of the specimens is twenty-five inches in length.

Rhinodoras prianomus, sp. nov.

Head long, extending (measured to the end of the opercular flap) the length of the short body to the origin of the upper and lower caudal radii, 2.5 times. The eye is one-seventh the length of the head, and is equidistant between the end of the muzzle and the edge of the operculum, and is half the interorbital width. Lateral scuta 22; the first and last with rudimental spine; that of the others strong and curved, the upper edge of the scutum with two or three prickles. The scuta leave a wide naked space above and below them. Radii, D. I. 6; A. 10; V. 7; P. I. 10. Dorsal and pectoral spines serrate to the base on their anterior edges; postclavicle with a longitudinal angle, which supports a series of processes and spines. Head and casque rugose above. Maxillary barbels reach to beyond eye; the outer mentals are .66 as long. Color brown, paler below, with numerous vertical dark brown spots on the sides. All the rayed fins, and the back at the base of the adipose, black. Head above and at sides gray with numerous large brown spots. Length to base of caudal fin (marginal) m. .12; to base of dorsal, .07.

From Nauta.

One of the specimens from Nauta measures twenty-five inches.

Corydoras ambiacus, Cope, Proceed. Acad. Phila., 1872, p. 280.

From Nauta.

Corydoras armatus, *Calichthys armatus.* Günth. Proceed. Zool. Soc. Lond., 1868, p. 231.

Callichthys asper, Quoy. Gaim.

Nauta.

Hoplosternum longifilis, Cuv. Val., Günther, v. p. 228.

Nauta.

Hypoptoporna bilobatum, Cope, Proceed. Amer. Philoso. Soc., 187.

Loricaria cataphracta, L. Günther, v. p. 255.

From the Marañon.

Loricaria rostrata, Spix, Günther, v. 256.

Liposarcus jeanesianus, sp. nov.

This large and handsome species is allied to the *L. pardalis*, Cast, and *L. varius*, Cope, but presents a number of peculiar features. It is elongate and depressed, the head moderately so only. The head enters the total length (with caudal) 5.75 times; while the greatest depth (in front of the dorsal fin) enters it eight times, the head being measured to the superior end of the branchial fissure. There is an obtuse canthus rostralis from the orbit to the nares, there is a strong nuchal angle (not a crest), and a low one corresponding to the outer border of the epiotic bone. The two nuchal scuta have two very low ridges each. The orbit is small, entering the length of the snout 6.5 times, and the interorbital width 3.25 times. The sculpture of the upper surfaces of the head consists of numerous close grooves forming various patterns. Two or three small spines on the interoperculum. Beard reaching the line of the front margin of the eye. Inferior surfaces to anal fin entirely granular. Scuta of the body in twenty-eight transverse and (at the dorsal fin) four longitudinal series. They have a low serrate keel which ends in a point. Six scuta between dorsal fins and fourteen between anal caudal. Radii D. II. 12; C. I. 14, I; A. I. 4; V. I. 5; P. I. 6. Base of the dorsal enters total length 3.5 times, and equals the length of the head and nape in front of it, exceeding the length of the pectoral spines by two interradial spaces.

Color olivaceous above with numerous black spots, which inosculate on the dorsal region; below lighter with numerous closely placed black spots. Fins clouded. Head very closely radiate, banded and spotted.

Total length .400 m. (15.75 inches); length to bases of caudal, .305; do. to anal, .200; do. to ventral, .140; do. to pectoral, .060; do. to edge of inferior lip, .034; do. to superior teeth, .011. Length of first dorsal spine, .071; humeral width, .077.

Two specimens from Nauta, Peru. Dedicated to Joseph Jeanes, of Philadelphia, one of the most liberal patrons of students of the Natural Sciences in the United States.

Liposarcus scrophus, sp. nov.

Size of the last species but much more robust and rough in character. The dorsal outlines arched, rising abruptly in a strong crest on the posterior cephalic scutum, and maintained by the rough lateral keels of the nuchal plates. The head enters the total length 4.25 times, and the greatest depth the same, five times. An obtuse ridge to nares and a low swelling on the upper part of the pterotic shield. There is an angular tuberosity on the upper posterior part of the orbit, and a low ridge on the inner side of each of the nares. Barbel only extending to line of interior nostril. Several strong spines on the interoperculum. Diameter entering length of side of muzzle four times, and three and a quarter times the interorbital width. Sculpture of the upper surfaces of the head consisting of lines of minute acute tubercles, which are nearly obsolete on the interorbital.

Lower surfaces everywhere rugose. Scuta in twenty-seven transverse, and four longitudinal series, all rugose with lines of points and each with an elevated keel-brush of small spines. The upper and lower series of lateral scuta are strongly angulate, and the sides are swollen from opposite the base of the dorsal fin. Five scuta between the dorsal fins and thirteen between the anal and caudal fins. Radii of fins; D. II. 12; C. I. 14, I; A. I. 4; V. I. 5; P. I. 6. Dorsal fin longer than high, entering total length 3.5 times and a little less than length in front of its first spine. Length of latter equal length of head to end of interoperculum. Pectoral fin stout, shorter than basis of dorsal fin by three interspaces. The lower caudal lobe is, as in *L. jeanesianus* considerably longer than the upper. Color uniform black; upper caudal ray yellowish.

	M.
Total length	0.370
Length to basis of caudal fin	.298
" " " of oval fin	.200
" " " of ventral	.145
" " " of pectoral	.070
" " " of edge of lower lip	.040
" to superior teeth	.014
" to first dorsal spine	.075
Humeral width	.093

Two specimens from Nauta.

Plecostomus virescens, sp. nov.

Head wide, depressed, muzzle moderately elongate; body and tail rather elongate. There is a very obtuse occipital and nuchal elevation, while the post and preorbital angles are well marked. A few preopercular spines. Head below naked behind the mouth. Teeth numerous, acutely incurved. Posterior lip entire, smooth; beard shorter than diameter of orbit. The latter is one-fourth the length of the head, and one-half the flat interorbital space. Length of head 4.25 times in the total minus caudal fin. Radii D. I. 7, I; C. I. 14, I; A. 5; V. I. 4; P. I. 6. Basis of dorsal equal space between it and second dorsal plus one scutum, and equal the length in front of it to the middle of the interorbital region. Pectoral spine reaching a little beyond base of ventral. Scuta 26—4, without keels but with numerous rugose ridges.

AUGUST 4.

The President, Dr. **RUSCHENBERGER**, in the chair.

Six members present.

Dimorphism in the Leaves of Acer Pennsylvanicum, Lin.—Mr. **THOMAS MEEHAN** exhibited some branches of Acer Pennsylvanicum, Lin. (*A. striatum*, Lamb), which had a remarkable system of dimorphic foliage, and which he believed had been generally overlooked.

The first pair of leaves developed after the bursting of the bud in the spring, were larger and more perfectly developed than any subsequent ones. In his specimens they were about six inches long and five wide, and strongly three-lobed towards the apex. The next pair, however, were usually lance linear, in the specimens exhibited about five inches long and less than two wide. Occasionally there was a tendency to the production of a pair of lobes, but usually the margins were entire or sparsely serulated. The third and subsequent pairs of leaves partook of the form of the first pair, though seldom so large. He had examined several hundred of young trees, and all had this singular dimorphic condition, the second pair in all cases having this peculiar narrow form.

It was worthy of remark that in plants with alternate leaves, the leaves with their axial buds were generally about the same size. In some few instances there were variations in the size, especially in the one-third arrangement of the leaves on the stem. In opposite leaved plants the rule was the other way; one bud or one leaf, either in the blade or petiole, being larger or longer than the other. In the maples this was especially the case. At times the petioles in some cases would be not more than half the length opposite. He had found this especial peculiarity, however, in no other species but *A. Pennsylvanicum* that he had been able to examine, which included most in common cultivation. It might be in *A. spicatum*, Lam., which he had not been able to examine this season, and which he supposed to be but a variety of *A. Pennsylvanicum.*

AUGUST 11.

The President, Dr. **RUSCHENBERGER**, in the chair.

Seven members present.

August 18.

The President, Dr. Ruschenberger, in the chair.

Fourteen members present.

August 25.

The President, Dr. Ruschenberger, in the chair.

Twenty members present.

On Pectinatella magnifica.—Prof. Leidy exhibited a living specimen of the fresh-water ciliated polyp, formerly described by him under the name of Pectinatella magnifica. It was obtained by him this morning from the mill-pond at Kirkwood, N. J., on the Camden and Atlantic R. R. The specimen, about four inches square and three inches thick, is a fragment of a large colony, which enveloped the submerged trunk of a tree. The entire colony was estimated to be about six feet long, and from six to twelve inches in diameter, including that of the tree trunk, which was about four inches. Several branches of the tree were also invested with extensions of the colony from six inches to a foot in length. Pectinatella is by far the largest of all the known fresh-water ciliated polyps, and, indeed, is not surpassed by any of the marine forms known to us. It has not been determined whether the huge Pectinatella colonies start each from a single individual, or are the result of the confluence of a number of small colonies. On the approach of winter the colonies die and undergo decomposition, in which process the remarkable winter eggs or statoblasts are liberated. These are provided with anchor-like spines, by which, as in the case of the eggs of skates and sharks, they become attached to various fixed bodies.

On a Parasitic Worm of the House-fly.—Prof. Leidy remarked that since it had become well known that many parasitic worms passed different stages of development within several different animals, he had from time to time sought for the sources from whence the more common thread worms obtained entrance into the human body, but thus far without success. The *Trichina spiralis*, discovered in man in 1833 by Mr. Hilton, and described and named by Prof. Owen in 1835, was first found in the hog by Prof. Leidy in 1846 (See Proc. A. N. S., iii. 108), but it was not until some years subsequently that it was determined that man and the hog acted reciprocally as hosts for the Trichina in its different stages of development.

In examining various common animals of our household, Prof. Leidy had found a thread worm, infesting the common house-fly. The worm is from a line to the tenth of an inch long, and lives in the proboscis of the fly. It was found in numbers from one to three in about one fly in five. The parasite was first discovered in the house-fly of India, by the English naturalist, Mr. H. J. Carter, who described it under the name of *Filaria Muscæ*, and suggested the opinion that it might be the source of the Guinea worm, *Filaria Medinensis* in man. Mr. Carter states that he found from two to twenty of the worms in one fly of three. Dr. Diesing referred the parasite to a new genus with the name of *Habronema Muscæ*. The singular position in which the worm lives suggests the many unsuspected places we have to search to find the parents or offspring of our own parasites.

Notice of some Fresh Water Infusoria.—Prof. LEIDY remarked that a species of Limnias, belonging to the order of wheel animalcules, or Rotatoria, was exceedingly abundant in our rivers. It lives in a tube, of its own construction, attached to aquatic plants and stones. He had not been able to determine whether it was a different species from the *L. ceratophylli* of Europe. The latter is described as solitary, but the common Limnias of our rivers is remarkable for the dense bunches that it forms. In many localities of the Schuylkill almost every stone exhibits multitudes of such bunches, pendent from the sides and under part. The bunches are conical, and usually one tube serves as a pedicle, while the others hang from it and often curve outwardly. From two or three to as many as fifty tubes may be counted in a bunch. This fasciculated character may distinguish the animalcule as a variety, which might be named *L. socialis*.

The bunches of Limnias form a support for a multitude of other animalcules. Among the latter, *Cothurnia pusilla* is quite common. Prof. Leidy had also observed upon the bunches on several occasions the curious branching infusorium described by Ehrenberg, and also described and figured by Claparede under the name of *Dendrosoma radians*. This measures a half a line or more in length, and terminates in branchlets, each with a rounded end, from which project a multitude of delicate rays, extending as much as the one-twelfth of a line in length.

SEPTEMBER 1.

The President, Dr. RUSCHENBERGER, in the chair.

Fifteen members present.

Dr. NOLAN, having announced the death of Dr. JOHN HAMILTON SLACK, made the following remarks:—

Dr. Slack was born September 23d, 1834. After graduating from the Department of Arts of the University of Pennsylvania, he made a tour of Europe, Northern Africa, and the Nile, and was elected a member of the Academy in July, 1857. During the same year he presented valuable specimens of Egyptian natural history and antiquities, for which the thanks of the Academy were formally returned. The next year he presented for publication a paper, which appeared in the Proceedings under the title "Catalogue and Notes on the Egyptian Antiquities in the Museum of the Academy." In the spring of 1859 he graduated from the Medical Department of the University, and at once applied himself to the practice of his profession and the study of natural history. From this time until his removal from the city he was an active and enthusiastic worker in the Academy. His name appears in the Proceedings as a constant contributor to the museum and library, and also as the author of three papers on Mammalogy, the most important of which was a monograph of the Prehensile-tailed Quadrumana of South America. The work, however, by which he will be longest remembered as a member of the Society is his Handbook to the Museum, the first edition of which appeared in 1861 and was rapidly exhausted. A second edition was immediately issued, and of this, also, several thousand copies were sold, showing that the Handbook supplied a want long felt, and which, in consequence of the partial rearrangement of the collections, again exists.

Dr. Slack was elected Librarian of the College of Physicians in December, 1864, and served until December 31, 1867. He removed from the city in 1868 to his estate in Warren County, New Jersey, which he named Troutdale, and where he resided until his death, on August 24, 1874, actively engaged in pisciculture. So highly was his work in this field appreciated that he was appointed one of the Fish Commissioners of New Jersey. He also rendered important service as Assistant United States Fish Commissioner under Prof. Baird, during the winter of 1873–74, in hatching nearly half a million eggs of the *Salmo quinnat* received from California, and in distributing the fry to various rivers of the Middle and Southern States. His contributions to the literature of practical fish culture during this time were numerous and valuable.

Dr. Slack was a gentleman of unusually varied attainments. Although he was most devoted to the natural sciences, he exhibited an active interest in literature and art. He possessed talents as a musical composer which, if cultivated, would have secured him a wide-spread reputation. As it is, his arrangement of Home, Sweet Home has rendered his name familiar to thousands who know nothing about his life-work. He extended hearty sympathy and valuable assistance to those who took an interest in the pursuits to which he was devoted; and these, as well as more advanced students of natural history, who recognized in him a valued associate, will hear of his death with unfeigned sorrow.

SEPTEMBER 8.

The President, Dr. RUSCHENBERGER, in the chair.

Fourteen members present.

The following papers were presented for publication:—

"Notes on Santa Fé Marls and some of the Contained Vertebrate Fossils." By E. D. Cope.

"On a new Variety of Helix." By James Lewis, M.D.

Notice of a Remarkable Amœba.—Prof. LEIDY stated that in the early part of last June, in examining some material obtained from a mill-pond at Absecom, New Jersey, he had observed a most wonderful amœboid animal, of which he had made notes, but was not able at the time to make a drawing and satisfactory description. Subsequently he sought patiently for two days in the same material for another individual, but without success. Last week he made a visit to the Absecom mill-pond to seek the curious amœboid, and was so fortunate as to find it again. Prof. Leidy exhibited a drawing of the animal, and described it as follows:—

The animal at rest is spherical or oval, or constricted back of the middle. In the spherical form it measured the one-fifth of a millimetre in diameter; in the oval and constricted form it was about one-fourth of a millimetre long, and one-sixth of a millimetre broad. It is white or cream colored, opaque, or translucent at the border, and was spotted green from food balls of desmids. It moves with extreme sluggishness, and with little change of form. From the fore part of the body the animal was observed to project almost simultaneously a number of long, conical, acute pseudopods, about the one-twelfth of a millimetre long. From the back part in the same manner a multitude of papillaform pseudopods were projected about the one-fiftieth of a millimetre long. All the pseudopods and the surface of the body everywhere bristled with innumerable minute spicules. From time to time more or less obtuse portions of the clear ectosarc were projected, and these likewise were observed to be covered with the minute spicules. The opacity of the animal prevented the exhibition of a nucleus, if such exists.

In general appearance the curious creature resembles one of the forms of *Pelomyxa palustris*, described by Prof. Greef, in Schultze's *Archiv*, vol. x. pl. iv., fig. 9, but in this, minute spicules project only from the posterior disk-like extremity of the body, as they have also been observed to do in the corresponding part of *Amœba villosa*, of Wallich, and perhaps other species.

The general spiculate character of the Absecom amœboid is probably sufficient to distinguish the animal generically from Amœba, and in this view the animal may be named *Deinamœba mirabilis*.

On the Mode in which Amœba swallows its Food.—Prof. LEIDY remarked that he had supposed that Amœba swallows food by this becoming adherent to the body, and then enveloped much as insects become caught and involved in syrup or other viscid substances. He had repeatedly observed a large Amœba, which he supposes to be *A. princeps*, creep into the interstices of a mass of mud and appear on the other side without a particle adherent. On one occasion he had accidentally noticed an Amœba, with an active flagellate infusorium, a Urocentrum, included between two of its finger-like pseudopods. It so happened that the ends of these were in contact with a confervous filament, and the glasses above and below, between which the Amœba was examined, effectually prevented the Urocentrum from escaping. The condition of imprisonment of the latter was so peculiar that he was led to watch it. The ends of the two pseudopods of the Amœba gradually approached, came into contact, and then actually became fused, a thing which he had never before observed with the pseudopods of an Amœba. The Urocentrum continued to move actively back and forth, endeavoring to escape. At the next moment a delicate film of the ectosarc proceeded from the body of the Amœba, above and below, and gradually extended outwardly so as to convert the circle of the pseudopods into a complete sac, inclosing the Urocentrum. Another of these creatures was noticed within the Amœba which appeared to have been inclosed in the same manner.

This observation would make it appear that the food of the Amœba ordinarily does not simply adhere to the body, and then sink into its substance, but rather, after becoming adherent or covered by the pseudopods or body, is then inclosed by the active extension of a film of ectosarc around it.

The death of Dr. Jeffreys Wyman was announced.

SEPTEMBER 15.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

On the Motive Power of Diatomes.—Prof. LEIDY made some remarks on the moving power of diatomes, desmids, and other algæ. While the cause of motion remains unknown, some of the uses are obvious. The power is considerable, and enables these minute organisms when mingled with mud readily to extricate themselves and rise to the surface, where they may receive the influence of light and air. In examining the surface-mud of a shallow rain-water pool, in a recent excavation in brick clay, he found little else but an abundance of minute diatomes. He was not sufficiently familiar with the diatomes to name the species, but it resembled *Navicula radiosa.* The little diatomes were very active, gliding hither and thither, and knocking the quartz sand grains about. Noticing the latter, he made some comparative measurements, and found that the Naviculæ would move grains of sand as much as twenty-five times their own superficial area, and probably fifty times their own bulk and weight, or perhaps more.

Dr. J. Gibbons Hunt made the following remarks:—

While examining, this summer, into the structure of some of the so-called insectivorous plants, but more especially into the anatomy of the genus *Nepenthes*, I observed a part which I have not seen expressed before, and of sufficient interest, perhaps, to go upon record.

In the vegetable kingdom it is exceedingly rare to meet with glands which have distinct *excretory* ducts. Some authors deny their existence entirely; but in *Nepenthes rafflesiana*, *N. distillatoria*, and *N. phyllamphora*, and probably in all the species, are large cylindrical glands which pour out their secretion through *distinct excretory ducts.* In *N. distillatoria* these glands are, on an average, about the one-thirty-fifth of an inch long, and the one-twentieth of an inch wide, while the ducts measure about the one-thirtieth of an inch in length. In the *Rafflesiana* the glands and ducts are much larger. A dense tissue of cells surrounds and thoroughly imbeds these glands in *Nepenthes*, and this peculiarity of position renders excretory ducts necessary for the secretion to find its way into the pitchers.

In the vegetable kingdom it is the rule for glands to be located *on* surfaces, but in *Nepenthes* where one system of glands is *imbedded* the duct becomes necessary, and so far as I know is the only instance of such ducts among plants.

September 22.

The President, Dr. Ruschenberger, in the chair.

Thirty-five members present.

Remarks on Sponges.—Prof. Leidy remarked that the animal nature and structure of the sponges were first clearly made known by Mr. H. J. Carter, of England, and Prof. H. James Clark, of this country. The sponges are compound, flagellate infusoria. The sponge infusorium had been appropriately named by Mr. Carter the spongozoon, the exact characters of which were first noted by Prof. Clark, and confirmed by Mr Carter. The spongozoon is a globular cell, surmounted by a delicate cup, from the bottom of which projects a flagellum. The little animals are situated on the interior of hollow spheres of the sponges sustained by the skeleton of the compressed animal, whether this be corneous, as in the common sponge, or whether it be siliceous or calcareous. The observations of Prof. Clark had been made on a fresh water sponge, to which he had given the name of *Spongilla arachnoidea.* Mr. Carter's observations had been made on both freshwater sponges and the different classes of marine sponges. Prof. Leidy at first supposed that the sponge described by Prof. Clark might be the one he had formerly noticed under the name of *Spongilla fragilis* (Proc. A. N. S. 1851, 278), but comparison proved them to be different. They are both of the same color, but the siliceous spicules of *S. arachnoidea* are stated to be tuberculate, while they are smooth in *S. fragilis.* Dr. Leidy had examined the spongozoon of the latter, and found that it presented the same essential structure as described by Prof. Clark and Mr. Carter in other sponges.

Prof. Leidy further remarked that he had found several specimens of the curious rhizopod, discovered by Cienkowski, and named by him *Clathrulina elegans.* They were found among Utricularia, but though retaining their stems were unattached and apparently dead. One of the specimens presented a peculiar and as yet unexplained character. On one side of the laticed head the orifices were capped with little inverted, hemispherical cups, from the top of which projected a funnel like the cup of the spongozoa. Prof. Leidy was pursuing his search for the living and attached *Clathrulina.*

Prof. Leeds made some remarks concerning a remarkable mineral found in a bank of white sand near Fayetteville, N. C. It was, in appearance, a rod of glass, four feet in length and two inches in diameter, which was made up of a great number of irregular fragments. These fragments were highly polished on one side—the side apparently turned toward the hollow axis of the rod, and excessively contorted on the exterior side. They consisted almost entirely of silex, the remainder being chiefly oxide of iron. Accurate analysis showed that the percentages of the constituents in these siliceous fragments and in the sand found in the hollow core of the rod were the same. On account of this identity in composition, and the incompetency of any other known agent to produce such a fusion of almost pure silex, it was concluded that this "rod of glass" was a result of lightning—a *lightning-tube* or *fulgurite*, as such products have been called.

Prof. Leeds also gave the particulars concerning a great elevation of temperature which had occurred in the adit level of a lead mine in Missouri, where the heat had suddenly risen from 60° to over 100°, and had compelled the workmen, for the time being, to suspend work. The earth was found to contain over 75 per cent. of sulphate of protoxide of iron, and the heating had been due to the rapid absorption of oxygen by sulphuret of iron, disseminated throughout the earth in a finely divided condition.

Change of Habit through Fungoid Agency.—Mr. THOMAS MEEHAN referred to a former communication in which he exhibited specimens of *Euphorbia cordata*, or *E. humistrata*, collected by him in the Rocky Mountains, and which, normally procumbent, had assumed an erect habit on being attacked by a fungulus Æcidium Euphorbiæ hypericifoliæ.

He now found that the common trailing *Euphorbia* of our section, *E. maculata*, when attacked by the same fungulus, assumed the same erect habit. There was an additional interest in this observation, from the fact that with change of habit of growth there was a whole change in specific character in the direction of *E. hypericifolia*. In a comparison of the leading characters of the two species, we see that in *E. maculata* there is a profusely hairy stem, while that of *E. hypericifolia* is nearly smooth. The same is true of the fruit. The leaves of the former species are very oblique at the base—the latter nearly regular. The flowers are produced in all the axils. In the *E. hypericifolia* the stems have a tendency to be nodose at the joints, while *E. maculata* is nearly free from this character, and the flowers are mainly in heads at the ends of the branches. The *E. maculata*, after the fungoid attack becoming erect, also becomes nodose, and has the flowers on the ends of the comparatively smooth branchlets, while the leaves have lost their pointed obliquity; and, in short, all the characters make an intermediate between the two species.

He said it would not be fair to assume, from these facts, that *Euphorbia hypericifolia* was an evolution from *E. maculata*, but, as there could be no doubt that nutrition was one of the factors in the government of form, we could say that certain phases of nutrition, brought about by an attack of a minute fungus, would change the characters to the direction of those in that species.

SEPTEMBER 29.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

There not being a sufficient number of members present for the transaction of business, in accordance with the By-Laws, the meeting adjourned until October 6.

On favorable report of the Committee to which it was referred, the following paper was ordered to be printed:—

NOTES ON THE SANTA FÉ MARLS, AND SOME OF THE CONTAINED VERTEBRATE FOSSILS.

BY E. D. COPE.

The palæontological and geological examination, conducted by the party of the U. S. Survey, west of the north meridian, Lieut. G. M. Wheeler in charge, has already, during the present season, developed facts of interest, some of which are noticed below. The exploration has extended to the extensive lacustrine deposit in the valley of the Rio Grande, which has been termed by Dr. Hayden the Santa Fé marls. This author describes the deposits as first appearing in the north near Taos, and continuing for an unknown distance southward, and occupying the valley between the Rocky Mountains on the east, and the Jemez range on the west, he regards it as late Tertiary, but without special determination or co-ordination with the other known lacustrine formations of this continent.

Abundant material having been obtained by the party, it is easy to determine the fauna, whose remains are entombed in it, to be a part of that already described by Dr. Leidy and the writer, as occurring in Dakota and Colorado, under the name of Pliocene. This conclusion is indicated by the presence of the genera *Hippotherium*, *Protohippus*, *Procamelus*, *Cosoryx*, *Merychyus*, and known Pliocene species of other genera, among which may be mentioned *Canis*, *Aceratherium*, etc. In addition to species already known, a number new to science were obtained, of some of which descriptions are appended.

Martes nambianus, sp. nov.

Represented by a mandibular ramus which supports three teeth. The anterior blade of the sectorial is rather obtuse. The first premolar is one rooted; the second and third are without posterior coronal lobe, but exhibit small basal lobes, both anterior and posterior. The anterior of the second is rather elevated, and the entire crown is directed obliquely forwards. Canine compressed. Mental foramina below the second and third premolars.

Measurements.	M.
Length of three premolars	.006
Elevation of anterior lobe of sectorial.	.002
Depth of ramus at anterior lobe of sectorial	.003

This species is of smaller size than the *M. mustelinus*, Cope,[1] and the sectorial tooth less elevated and trenchant.

Cosoryx ramosus, sp. nov.

Char. Gen.—Inferior molars prismatic, 3–3; the premolars all sectorial, last with short branch crests. Molars with basal intercolumnar tubercles. Horns superciliary, solid, branched.

This genus was indicated by Dr. Leidy from a horn of the species known to him, the *Cosoryx furcatus*, from the Pliocene beds of the Niobrara. The same, or a similar species, has left abundant remains in the Santa Fé marls, and, in connection with the more numerous *C. ramosus*, has enabled me to determine the dental and other characters of the genus.

After a careful examination of the horns of these species in my possession, those of eighteen individuals (at least I find that of ten where the basal portion is preserved), the beam has been broken off and reunited by anchylosis in six. In most of these the spot is marked by a ring of exostosed tuberosities, like those constituting the burr of the deer's horn. The fracture has taken place in every instance at a point as far above the frontal bone as the burr of deer is situated, and is irregular in outline, higher on one side than the other. In some of the specimens the smaller antlers are also broken, and exhibit a similar burr, but the terminal portion is usually lost. In one specimen, a broken antler is anchylosed in the usual manner of overlapping ends.

The horns are solid, the centre having a narrow spongy axis. The surface is dense, and marked by arterial grooves, but not pierced by noticeable foramina.

It is evidently a question whether this genus should be referred to the hollow or solid horned Ruminantia, to the *Bovidæ* or *Cervidæ*. The horns might be regarded as those of deer, were it not for the occasional specimens without burr, while the teeth are both cervine and bovine. We may here draw such inferences as we can respecting the nature of the covering of the horn. That the fractured beam should not be lost, indicates the presence of some kind of covering to retain it. That this covering was not horny, is probable from the fact that the horns are branched, a structure impossible to the *Bovidæ*, since antlers effectually prevent the usual mode of increase of horn by additions at the base and removal at the extremity. That such covering protected arteries, which aided in the production of the burrs, is also probable. We may thus believe it to have been dermal like that of the giraffe or the *Antilocapra* at the period of immaturity of its horny sheath.

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[1] Hayden's Annual Report, 1874.

It may be concluded then that the genus *Cosoryx* represents the ancestral type of the *Cervidæ*, and explains the origin of the remarkable type of horns of that family as follows: Ruminants with fixed horns of structure more dense and brittle than others of the same type, in their annual combats at the rutting season, very frequently broke the beams off not far above the base. The usual location of nutrition followed, which being annually repeated, became as periodical in its return as the activity of nutrition of the reproductive system. This activity ceasing, the horn being dense lost its vitality, the more so as the normal covering would have already perished in its distal portions. The natural consequence, the separation of the dead from the living bone by suppuration, would follow. This process would, however, probably require a longer time for the establishment of its periodical return than the fracture and attachment of the existing horn.

This appears to be the only explanation of the origin of the phenomena exhibited by the horns of the *Cervidæ*, and is suggested by the specimens of *Cosoryx* to be described.

Char. Specif.—This species is larger than the *C. furcatus*, Leidy, and exhibits two antlers instead of one, of which the first is given off at a point much further from the base than in that species.

The beam near the base is curved a little inwards, and is semicircular in section, the outer face being slightly concave, the inner very convex. The base is situated a short distance within the free superciliary border. The beam becomes more cylindric, and then expanding in a fore and aft direction, gives off an antler at right angles, nearly parallel to the cranial axis. At a distance little over half the elevation of the first antler, the beam gives off a second, in a plane transverse to the axis of the skull. The terminal portion of the beam is cylindric, curved, and acute at the apex.

Mandibles with teeth of two species of this genus were found, the smaller of which, occurring with the other portions of *C. furcatus*, belong to it. The larger differs in the elevation of the intercrescentic column of the first molar, which is worn into a loop at ordinary maturity; this may however be but an individual variation. The diastema is long, and the ramus of that point quite slender.

Measurements.	M.
Long diameter base No. 1	.016
" " " " 2	.020
Elevation of first antler from base No. 1	.080
" of second antler from first No. 3	.042
Length of terminal part of beam No. 4	.095
" of molars 2–5, No. 5	.037
" of molars 4–5, No. 5	.022
" of fifth molar	.012
Width of fifth molar	.006

Cosoryx teres, sp. nov.

Established on the connected frontal bones supporting the horns of one specimen, and represented by portions of horns of two others. The former individual is larger than any one belonging to the other species, and the species is doubtless the largest of the genus. The horns stand above the posterior part of the orbit, which excavates its base, and presenting a considerable face descending into the temporal or zygomatic fossa. There is no free superciliary rim outside of the base as in *C. ramosus*, Cope. The section of the beam near the base is a regular oval, the long axis directed longitudinally and a little outward in front. The beam is erect with a slight curvature outwards at the inner base only. So far as preserved it does not branch, but may do so in its distal portion which is lost. The tissue is more spongy interiorly than in the other species; supra-orbital foramen far within the superciliary border.

Measurements.	M.
Outer width between bases of horn cores	.112
Inner width between bases of horn cores	.055
Width of temporal fossa behind horns	.053
Long diameter horn core	.028
Short diameter horn core	.021
Length of part preserved	.033

This species was as large as the *Antilocapra americana* of the plains.

Hesperomys loxodon, sp. nov.

An entire mandibular ramus with all the teeth preserved, was found in the same deposits as the preceding species.. Molars subequal, short-crowned, triturating surface sigmoid. The apices of the sigma on the inner side, tubercular, and anterior to the outer apices. First molar with an additional transverse crest in front. Incisor compressed, outer angle of enamel face rounded, smooth. Molar series oblique, rising anteriorly.

Measurements.	M.
Length of molar series	.0050
" of first molar	.0018
Depth below last molar (inner side)	.0030
" below first molar	.0045
" of incisor	.0015
" as diastema	.0027

Panolax sanctæfidei, gen. et sp. nov.

Char. Gen. Molars prismatic, transverse, except the first and last, each divided by a plate of enamel extending transversely from the inner side. Anterior molar longitudinal; posterior molar composed of two columns.

This genus is represented by numerous teeth and portions of the cranium. It evidently belonged to the *Leporidæ*, and is allied to both *Lepus* and *Palæolagus*. As the teeth are mostly separate, it is not easy to determine which is the posterior and which the anterior molar. Judging by the analogy of the known species, the determination as here made is correct; should the relations be reversed the species will be referred to *Palæolagus*.

Char. Specif. The teeth are curved, the convexity inwards. Inner face grooved, the groove occupied by cementum; the outer border compressed either without or with very shallow groove. First molar with triturating surface twice as long as wide with an entering loop of enamel on the inner side, anteriorly narrower. Last molar as wide antero-posteriorly as transversely, the shaft curved backwards; the posterior column sub-cylindric half the diameter of the anterior.

Measurements.		Inch.
Diameter of middle molar	antero-posterior	.093
	transverse	.187
" first molar	antero-posterior	.140
	transverse	.062
" last molar	antero-posterior	.100
	transverse	.065
Length of crown of last molar		.250

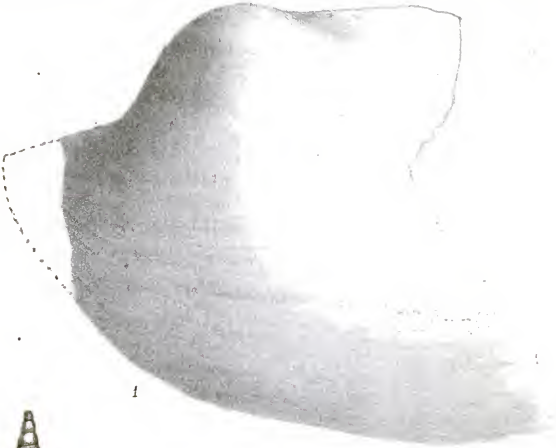
This species is about the size of the northern hare.

Cathartes umbrosus, sp. nov.

Represented by numerous portions of nearly all parts of the skeleton, in excellent preservation. The beak from the frontal bone to near the apex is preserved; it displays the depression just anterior to the nares, which marks the anterior boundary of the cere. The culmen is nearly horizontal to just beyond this mark, and then exhibits a gradual decurvature to the apex. The beak is strongly compressed, and the tomia strongly decurved, forming an open festoon, whose middle point marks one-fourth the length of the beak from the nares. The latter are directed obliquely downwards and forwards, narrowing anteriorly, and having a prominent inferior bounding ledge. The mandible is weak, the symphysis marking on half the length of the beak, from the anterior angle of the nares.

The bones of the anterior extremities exhibit large and powerful proportions as compared with the posterior, appropriately to capacity for sustained flight. The head of the humerus is much compressed, and the articular face is nearly divided into two by the deep bicipital groove. The head of the femur is small, and the rotular face, a wide and deep groove. The tibia is slender, the shaft much compressed, with a prominent ridge. The cnemial crest is short, and not produced downwards on the shaft. The distal posterior bridge is narrow and oblique. The tarso-metatarsus has a strong exterior crest which constitutes half the width of the shaft.

Measurements.		Inch.
Length of beak from base of culmen	axial	1.90
“ from cere to apex		1.20
Depth of beak at culmen		.87
“ of pre-maxillary at festoon		.75
Length of symphysis		.69
“ of nares		.37
Width of palate at festoon		.50
“ of head of humerus		1.37
“ of condyles		1.13
“ of distal end femur		.94
“ of head of tibia		.81
“ of condyles of tibia		.66
“ “ of tarso-metatarsus		.75
Length of a first phalanx		1.12
“ of seven sacral vertebræ		1.87
“ of two dorsal vertebræ		1.12
Depth of a dorsal vertebra (total)		.93
“ “ “ to roof of arch		.44
“ of centrum of roof of arch		.25
Width of “ “ “		.32
Length of two cervical vertebræ		1.12
Depth “ “ to apex neural spine		.44
“ of articular face centrum		.17
Width “ “		.25



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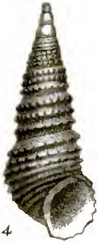

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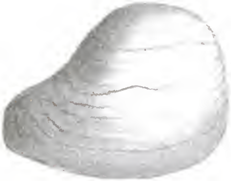

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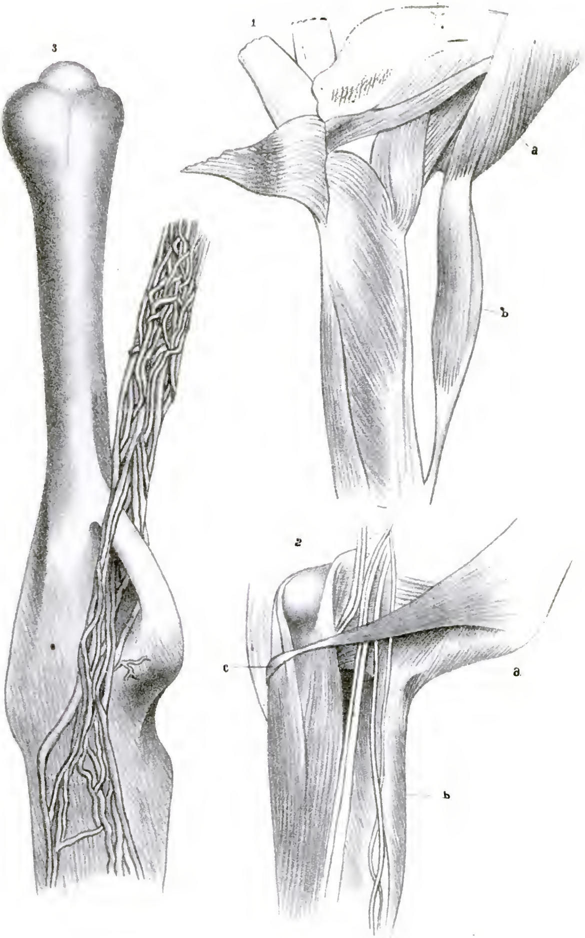
Conrad's Fossils of the Pebas Group



CHAPMAN ON BRADYPUS, ATELES AND MACACUS.

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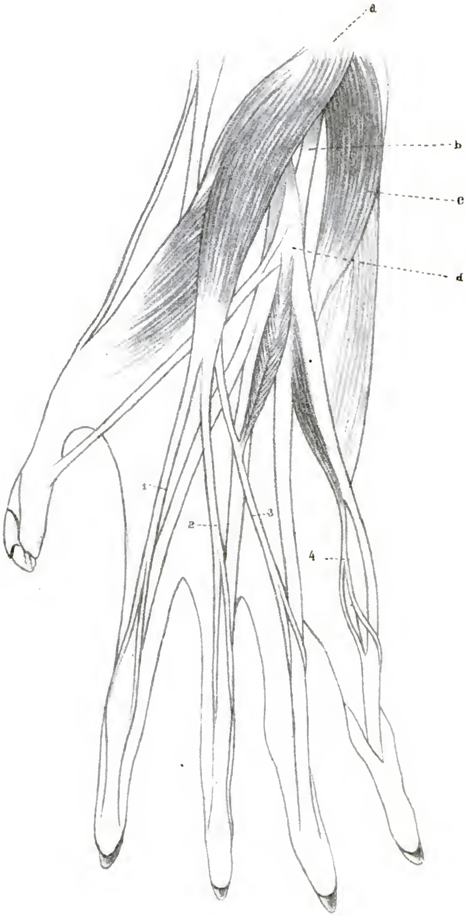

CHAPMAN ON ATELES.

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